A KEY PLAYER IN THE ARCTIC THE UNIVERSITY OF THE ARCTIC AND THE CHALLENGES AHEAD

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ARCTIC

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INTRODUCTION

This publication is the result of cooperation between The Scandinavian Seminar College, a non-governmental institution, The Danish Society for Futures Studies and The University of the Arctic.

It has two major objectives: To introduce to a wider international audience the University of the Arctic as a major player in the Arctic region and to highlight the issues pertaining to this region in the forthcoming United Nations Conference on Climate Change to take place in Copenhagen, in December 2009 under the auspices of the Danish Government.

The UN conference on climate change will, of course, concern itself with many issues common to all peoples of the Earth but also the variations resulting from differences in living conditions.

In the Nordic countries and among peoples living along the same latitudes around the top of the globe, the interest naturally focuses on those changes in living conditions which concern the Arctic region. The annual melting rate of the glaciers as well as the ice cap is increasing each summer, and access to commercial and tourist navigation of the Arctic Ocean is expanding . The North East passage along the North coast of the Euro-Asiatic Continent is already used for year round commercial traffic with specialized vessels, and the North passage between Canada and Baffin Island is expected to become open for regular traffic, at least in the summer, in the foreseeable future. Also there has been debates concerning to rights to explore and make use of the deep sea resources around the North Pole.

Simultaneously, the melting and retreat of the ice hampers access to traditional hunting and fishing grounds of the local people in the Arctic region. And the digital revolution has also swept across the Arctic and has made the land of the Inuit people part of the Global Village.

These are some of the issues raised in this publication, which will be among many highlighted at the UN Conference in Copenhagen. We hope this will be a useful, albeit small, contribution to the agenda of the conference.

Erling Olsen
Chairman of Scandinavian Seminar College

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› *Old coal mine on the island Spitsbergen at Svalbard*

Photo: Kai Jensen / Scanpix

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GLOBAL WARMING *and the Arctic*

The Arctic is global warming's canary in the coal mine. It's a highly sensitive region, and it's being profoundly affected by the changing climate. Most scientists view what's happening now in the Arctic as a harbinger of things to come.

For 125 years scientists have had special research programmes for the Arctic and Antarctica. Scientists from all over the world are now studying questions relating to climate change in the research programme called the International Polar Year 2007-08.

Such programmes have existed before. 1882-83 was the first one. Karl Weyprecht, from Austria, wanted to study meteorology and realised that exploring the Arctic called for international co-operation. In the second International Polar Year 1932-33 scientists from 40 countries built permanent observation stations in the Arctic and Antarctica to study the weather phenomena there. The third effort in 1957-58 was called the International Geophysical Year, and thanks to modern science the existence of Van Allen radiation belt and the continental drift were confirmed.

In the 19th Century, scientists realized that gases in the atmosphere could cause a "greenhouse effect" which affects the planet's temperature. They were chiefly interested in the possibility that a lower level of carbon dioxide gas might explain the ice ages. At the turn of that century Svante Arrhenius in Sweden calculated that emissions from industries might someday bring global warming.

Ice cores and other evidence of climate conditions in the distant past provide evidence that rising atmospheric carbon dioxide levels are associated with rising global temperatures.

Human activities, primarily the burning of fossil fuels and secondarily the clearing of land have increased the concentration of carbon dioxide, methane and other heat-trapping gases in the atmosphere. Since the start of the industrial revolution, the atmospheric carbon dioxide concentration has increased by about 35%.

Consequently we may be in for a very hot future and much sooner than predicted and that is not necessarily contradictory to a colder climate in Scandinavia and northern Europe.

Continuing to add carbon dioxide and other greenhouse gases to the atmosphere is projected to lead to significant and persistent changes in climate, including an increase in average global temperature of 1.4 to 5.8° C (according to the IPCC) over the course of this century.

Climatic changes are projected to include shifts in atmospheric and oceanic circulation patterns, an accelerating rate of sea-level rise, and wider variations in precipitation.

Together, these changes are projected to lead to wide-ranging consequences including significant impacts on coastal communities, animal and plant species, water resources, and human health and well-being.

About 80% of the world's energy is currently derived from burning fossil fuels, and carbon dioxide emissions from these sources are growing rapidly. Because excess carbon dioxide persists in the atmosphere for centuries, it will take at least a few decades for concentrations to peak, and then begin to decline even if concerted efforts to reduce emissions are begun immediately. Altering the warming trend will thus be a long-term process, and the world will face some degree of climate change and its impact for centuries.

There are at least 10 worrying factors that now interact:

1 After 1990 we have experienced the 11th warmest years since reliable measurements began in the mid-19th century. The greatest effects of a changing climate can be observed in the Arctic.

2 The solar theory is not completely dead but almost all in the scientific community now agree that the globe is warming and that pollutants and greenhouse gases, especially carbon dioxide, are the biggest contributor to the increasing temperatures. The carbon dioxide level has varied in historic time from 180 to 280 ppm but has now risen to 380 ppm. This is higher than during the last million years.

3 There has been a warming trend on Earth's surface since the early 20th century.The temperature has risen 0.6° C since 1900 and continues to rise.

4 The Arctic, a place where any warming trend would be amplified by changes in local absorption of heat as the ice melts, does indeed show signs of rapid warming. A report published last year shows that the amount of sea ice has fallen 8% per decade during the past 30 years and temperatures have increased 3-4° C in some areas in northern Alaska.

5 The fifth finding is the resolution of an inconsistency about whether the atmosphere was really warming. This was a disagreement between the temperature on the ground, which appeared to be rising, and further up in the atmosphere, which did not. Now, both are known to be rising in parallel.

6 The sixth is a study by researchers at Scripps Institution of Oceanography, California, into changes in the way the world's oceans have warmed up at different depths over the past 65 years. These match climate models' predictions of

what happens when warming is induced by greenhouse gases much better than they match predictions of the result of variations in the sun's activity.

7 The seventh observation is a predicted link between increased sea surface temperatures and the frequency of the most intense tropical storms, hurricanes and typhoons.

8 Lately, reports of an observation that ocean currents in the North Atlantic are faltering, by 30% since 1992, and in ways that computer models predicted would happen in response to increased temperature. That could have a severe effect in northern Europe that now has a warmer climate because of the Gulf stream and the prevailing westerly winds.

9 The glaciers of Greenland are melting faster than expected. The speed at which the glaciers flow towards the sea has doubled to 12 km a year over the past decade. As a result, the volume of ice falling into the sea has doubled over the same period. Taking both factors into account the rate at which global sea level has increased has risen from 0.23 mm a year in 1996 to 0.57 mm in 2005.

10 Studies of Palaeocene-Eocene Thermal Maximum (PETM) period, some 55 million years ago, when temperatures of tropical waters rose to 38° C, compared with 26° C to 28° C today, show that this warm period led to dramatic migrations of animals towards the poles. Scientists have tried to draw a link between the PETM results and the computer models that have been developed to study the modern climate. The climate models, when fed conditions resembling this ancient period, come up with temperatures that are too low. This is probably the single scariest result of deep-time palaeo-climate work. The models that are used to predict the future have been shown to be conservative and the scientists do not know why.

EFFECTS IN THE ARCTIC

The Arctic is extremely vulnerable to observed and projected climate change, and the Arctic is now experiencing some of the most rapid and severe climate change in modern times. An acceleration of the climatic trends is projected to occur during this century due to the increases of greenhouse gases in the atmosphere, and the climate changes are being experienced particularly intensely in the Arctic. Since these changes will in turn impact the planet as a whole, people outside the Arctic have a great stake in what is happening there.

Climatic processes unique to the Arctic have also significant effects on global and regional climate through increased global warming and rising sea levels. In the Arctic region the reduction of the sea ice is very likely to have disastrous consequences for polar bears and seals that live on the ice and thus also for people whom these animals are a primary food source. On the other hand, reduced sea ice is likely to increase marine access to the natural resources of the region such as oil and gas as well as greater opportunities for shipping.

An ice free north-east passage for instance means much shorter shipping distances to Asia from Europe. London to Tokyo via the Suez Canal is 20.900 km and the distance through the north-east passage is only 13.000 km, almost 8000 km or 38% shorter. New York to Tokyo via the Panama Canal is 18.200 km but via the north-west passage only 14.000 km a net saving of 4.200 km or 23%.

Much more could be said about the global warming in the Arctic but like the general effects mentioned earlier the key findings could also be summarized in ten points according to "Arctic Climate Change and Its Impacts 2001".

1 Arctic climate is now warming rapidly and much larger changes are projected.
Additional evidence of Arctic warming comes from widespread melting of glaciers and sea ice, and a

Photo: Amanda Graham

shortening of the snow season because of warmer winters. Increased precipitation is also a projected factor.

2 Arctic warming and its consequences have worldwide implications.
Melting of highly reflective arctic snow and ice increases the absorption of the sun's heat and further warming of the planet. Increases in the glacial melt and river runoff add more freshwater to the ocean, raising global sea level and possibly slowing the ocean circulation that brings heat from the tropics to the poles, affecting global and regional climate as in northern Europe.

3 Arctic vegetation zones are very likely to shift, causing wide-rangingeffects.
The tree line will move northward and to higher elevations, with forests replacing a fraction of existing tundra, and tundra vegetation will move into polar deserts.
Agriculture will have potential to expand northward due to a longer growing season.

4 The diversity and distribution of animal species will change.
Reductions in sea ice will drastically shrink marine habitat for polar bears, seals which live on the ice, and some seabirds, maybe pushing some species towards extinction.
Caribou/reindeer and other land animals are likely to be increasingly stressed as climate change alters their access to food sources, breeding grounds and historic migration routes.
Impacts of Arctic climate change will have implications for biodiversity around the world because migratory birds and other species depend on breeding and feeding grounds in the Arctic.

5 Many coastal communities and facilities face increasing exposure to storms.
Severe coastal erosion will be a growing problem as rising sea level and a reduction in sea ice allow higher waves and storm surges to reach the shores and thawing permafrost weakens coastal lands, adding to their vulnerability. Communities are already threatened or being forced to relocate.

6 Reduced sea ice is very likely to increase marine transport and access to resources.
The continuing reduction of sea ice is very likely to lengthen the navigation season and increase marine access to the Arctic's natural resources and allow increased extraction of oil and gas.

7 Thawing ground will disrupt transportation, buildings and other infrastructure.
Transportation and industry on land, including gas and oil extraction and naturally forestry will increasingly be disrupted by shortening of the periods during which ice roads and tundra are frozen sufficiently to permit travel.
As frozen ground thaws many existing buildings, roads, pipelines, and industrial facilities are likely to be destabilized requiring substantial rebuilding maintenance and investment.

8 Indigenous communities are facing major economic and cultural impacts.
Many indigenous peoples depend on hunting polar bear, walrus, seals, and caribou, herding reindeer, fishing and gathering for food and to support the local economy. These activities are also the bases for cultural and social identity.
Changes in species ranges and availability, access to these species, a perceived reduction in weather predictability, and travel safety in changing ice and weather conditions present serious challenges to human health and food security and can in the long run threaten the survival of some cultures.

9 Elevated ultraviolet radiation levels will affect people, plants, and animals.
The stratospheric ozone layer over the Arctic is not expected to improve significantly for at least a few decades largely due to the effect of greenhouse gases on stratospheric temperatures.
Ultraviolet radiation in the Arctic is thus projected to remain elevated in the coming decades. A lifetime dose is expected to be about 30% higher than before.
Elevated ultraviolet radiation can disrupt photosynthesis in plants and have detrimental effects on early life stages of fish.

10 Multiple influences interact to cause impacts to people and ecosystems.
Changes in climate are occurring in the context of many other stresses including chemical pollution, overfishing, land use changes, habitat fragmentation, human population increases and cultural as well as economic changes. These stresses can combine to amplify impacts on human and ecosystem health and well-being. The total impact can be greater than the sum of its parts which makes it difficult to predict.

Consequently, we may be in for a very hot future and much sooner than predicted, and that is not necessarily contradictory to a colder climate in Scandinavia and northern Europe.

Many indigenous peoples depend on hunting polar bear, walrus, seals and caribou, herding reindeer, fishing and gathering food to support the local economy. These activities are also the bases for cultural and social identity.

Photo: Amanda Graham


Map: © University of the Arctic 2009, Philipp Rekacewicz, Veli-Pekka Laitinen and Hugo Ahlenius, Nordpil
Member institutions

› **ERLING OLSEN**
Professor Dr.Polit. Founder of the University of Roskilde, Denmark, member of four Danish governments, speaker of the Danish Parliament. Acting Secretary General of International IDEA in Stockholm. Member of the University of the Arctic's Board of Governors since 2001, Chairman of Scandinavian Seminar College.

FROM IDEA TO INSTITUTION

The story of University of the Arctic

AN IDEA IS BORN

In 1996 politicians in the 8 Arctic countries – Canada, Denmark, Finland, Iceland, Norway, Russia, Sweden and USA – launched The Arctic Council and summoned a conference of parliamentarians to discuss the effects of the predicted climate changes.

Simultaneously, a conference of researchers and technologists was summoned by GRID Arendal in cooperation with the Norwegian Fridtjof Nansen Institute and the American-Scandinavian NGO Scandinavian Seminar College (SSC). Associated with the United Nations Environmental Programme (UNEP) the GRID-Arendal foundation in Norway provides environmental information, communication and capacity building services and it serves as UNEP's Key Polar Centre.

These conferences made 3 things clear: First, that climate change opened up new opportunities for the Arctic and new risks. Second, that to exploit the new opportunities and limit the new risks the Arctic needed an enlightened population and a well focused investment in research. Third, that no single university in the Arctic could deliver what was needed.

There were of course good universities in the Arctic. But their student enrolments were usually so limited that they only could deliver a limited number of courses. Consequently, students form the Arctic often had to go south to get a more comprehensive higher education. In the South they might get married or find a good job, and many stayed down South.

The Arctic Council's senior officials (SAO) got, however, the idea to create a network of Arctic universities, a so-called university without walls, named University of the Arctic (UArctic) that should do what no single Arctic university could do. In the circumpolar area it should deliver an Arctic relevant 4-year higher education, called Bachelor of Circumpolar Studies (BCS) that could prepare the students for an active future in the circumpolar area.

A mobility programme should provide scholarships for travel and accommodation making it possible for students to take for example, one of the BCS courses in Alaska, another in Rovaniemi, Finland, another in Yakutsk, Russia, and another in Tromsø, Norway. There should also be a mobility programme for exchange of teachers and researchers between member universities.

> *A core activity from the very start of UArctic was to build competence in northern issues on the diversity found in the north among regions and peoples. To that end, a special programme was designed – Circumpolar Studies, to be taught at UArtic member institutions and delivered online.*
>
> Bjørn Sangdal, Bodø University College, Norway

THE IDEA IS EXPLORED

The SAO asked the outstanding British Arctic expert, Professor Bill Heal, to chair a group of experts exploring the network idea. In October 1997 the Healgroup suggested that the SAO ask the Circumpolar Universities Association and the permanent representative of the Arctic Council to do a feasibility study on a circumpolar network of universities.

SAO did as suggested and the results of the feasibility study were presented at a meeting in the Arctic Council where ministers of the 8 participating countries recommended the establishment of an Interim Council of Universities that wanted to join the network.

The Interim Council began its planning activities in December 1998. Among its members was Scandinavian Seminar's Olav Hesjedal. Most of the planning was done by volunteers but part of the work was funded by grants from the Nordic Council of Ministers and the Danish Ministry of Foreign Affairs. It was also a great help that the Finnish government after January 1999 funded a secretariat at University of Lapland in Rovaniemi called UArctic's Circumpolar Coordination Office with Outi Snellman as its dynamic leader.

The Interim Council's *first task* was *to develop the structure of the four year Bachelor education.* It should determine the content of the courses which every BCS student should take and ensure that at least one of UArctic's potential members always would be able to deliver it at the required level. The Interim Council's *second task* was to find out *which courses could be delivered as distant learning* and to create an appropriate balance between distant learning and learning in classrooms. Canadian and Russian experiences warned that distance learning might be rather boring and less motivating unless it was followed up with classroom learning. It was also appealing for students from one part of the circumpolar world to be taught in a classroom together with students from other parts of the region.

› *The University Centre in Svalbard*

Among UArctic's member institutions are also indigenous organizations interested in higher education in the Artic.

› *BCS Students*

The Interim Council's *third task* was to ensure that *UArctic would be a supplement and not a competitor to its member institutions*. This was done by demanding that BCS diplomas should be issued by the student's home institution when the UArctic Registrar provided the information on where and when the required courses have been passed. The Interim Council's *fourth task* was to *minimise the external funding* needed by UArctic. This was done by only asking its member institution to offer BCS courses that they normally would offer their own students. This means that all BCS courses would be funded as in-kind deliveries from UArctic and organizations. Funding from public and private sources would then only be needed to cover the programme's overhead costs. This would reassure the member institutions that they need not spend any of their own resources on UArctic. Their resources spent on a BCS course would be primarily for their own students. In addition, even if the institution only offers one BCS course, it would still be possible for its students to get a full BCS education by taking other BCS courses at other members of UArctic. It could also attract students from other UArctic members.

The Interim Council's *fifth task* was to create a *governance structure* for UArctic. The Interim Council's sixth task was to indicate what UArctic might offer in addition to the BCS programme. Among these were an Open Learning system making it possible for northerners and others to upgrade their skills by taking only few courses, a field programme for graduate students, and a PhD network

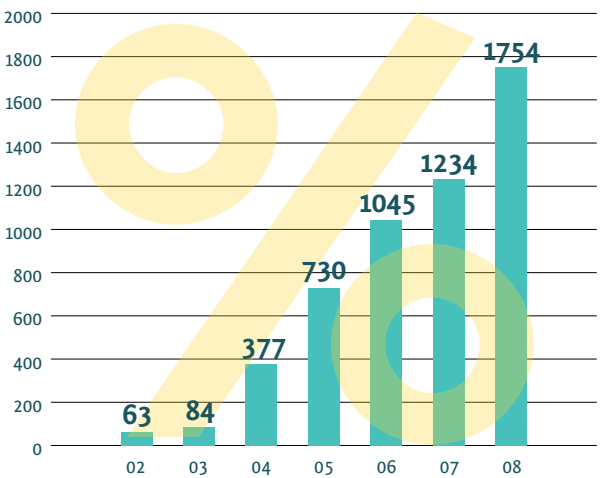
UARCTIC IS LAUNCHED

The Interim Council worked with such enthusiasm and efficiency that a formal launch of UArctic took place in June 2001 at a ceremony in Rovaniemi, Finland. The Interim Council finished its work and a permanent Council was established with representatives from UArctic's then 33 member institutions. UArctic also established a Board of Governors. By December 2008 UArctic had 116 member institutions of which 83 were higher education institutions and 33 other organizations that include research institutions, indigenous organizations and other Nordic actors interested in the cause of higher education in the Arctic. Their geographic distribution was:

Countries	Canada	Denmark/ Greenland	Finland	Iceland	Norway	Russia	Sweden	United Kingdom	USA	Total
Members	30	4	10	5	17	33	6	1	10	**116**

The diversity of UArctic's member institutions is reflected by their student numbers, varying from small northern indigenous colleges to large research universities. The largest group of UArctic higher education institutions have less than 3,000 total students (47%), 31% have between 3,000 and 10,000 students, while the remaining 22% have 10,000 or more students. Some measure of the membership's geographic presence in the North can also be seen from the fact that 41 of UArctic's members are located on or above the Arctic boundary as defined by the Arctic Human Development Report. Collectively UArctic's members have over 700,000 students and 50,000 academics on their staffs.

THE BACHELOR PROGRAMME



Student enrolments 2002-2008

Registrations in the BCS-programme have increased continually. In 2002 student enrolments totalled 1,754 and today aggregate BCS student enrolments are 5,287. Currently, 82% of all BCS students take courses in classes and 18% online.

The BCS-programme consists of an introductory course, six core courses, and several advanced level options, all described on UArctic's homepage www.uarctic.org .The first semester's course introduces students to the landscape, peoples and issues of the circumpolar region. Beginning with an examination of the geography, biological and physical systems of the Subarctic and Arctic, it then describes the aboriginal and contemporary peoples of the region. The history of the Circumpolar World is treated in a broad fashion, to provide grounding in the events and developments that have created the region's contemporary characteristics. The second part of the course surveys some of the particular issues facing the region, including climate change, economic, political and social development. This course ultimately is intended to stimulate interest in the circumpolar world.

Then follows 6 semesters with core courses on "Land and Environment", "Peoples and Cultures" and "Contemporary Issues" of the circumpolar world. During the 8th semester the student can choose to study one of presently thirteen so-called Advance level Options:

- Aboriginal Public Administration
- Arctic Environmental Technology
- Arctic Governance
- Arctic Perspectives on Norwegian Arts and Crafts
- Circumpolar Ecosystems, Resource Use and Management
- International Project Management
- Management of Local and Regional Development
- Nature, Life and Culture in Arctic Norway
- Northern Land Contaminants
- Northern Peoples and Environments
- Northern Scandinavian Politics and Society
- Northern Tourism
- Polar Oceanography and Meteorology

INSTITUTE FOR APPLIED CIRCUMPOLAR POLICY

In 2007 UArctic was well established and new opportunities emerged. Consequently, its Board of Governors started developing a new Strategic Plan covering the period 2008-13. The new plan seeks to develop comprehensive graduate studies on top of the BCS. It emphasized thematic networks to promote circumpolar coop-

› *BCS Students at the University of Lapland*

eration in training, education and research design and application. It made adaptation to climate change and the North as an energy resource among its central issues, and it sought to help decision makers find solutions to the most urgent problems of the North. Consequently, in December 2008 UArctic established an Institute for Applied Circumpolar Policy by a cooperative effort of Dartmouth College, University of Alaska Fairbanks and Urbana University. The institute is housed at the Dicky Center, Dartmouth College, New Hampshire, USA.

The main challenges of the Institute are to assist decision makers in identifying the new chances, limit the risks and live up to the new responsibilities in the circumpolar area.

Tables 1-3 indicate how they are caused by Technological Development, Globalization and Climate Change. The following text indicates how University of the Arctic provides tools to deal with the new responsibilities

The most urgent problems of the North are technological development, globalisation and climate change. Together they make us all stakeholders in the Arctic, giving us new opportunities to engage, new risks to minimize and new responsibilities to live up to. In a presentation to be published in the Heidelberg Journal of International Law I included the following tables of the new opportunities, new risks and new responsibilities in the Arctic region and mentioned how they were illuminated in teachings and research projects at UArctic.

TABLE 1. EFFECTS OF TECHNOLOGICAL DEVELOPMENT

Technological Development	Enhanced or new Opportunities	Enhanced or new Risks	Enhanced or new Responsibilities
Telecommunication (Texts, sounds and pictures)	Instant news from the whole world	Weaker local commitment	Awareness of traditional culture
	Access to other cultures	Loss of parts of own culture	_
	Telemedicine	Weaker traditional health care	_
	Teleconferences	Loss of parts of self-government	Respect for subsidiarity
	Distant learning	Weaker contacts to fellow students	Combinations with classroom learning
	Distant working	Weaker contacts to fellow workers	Updating with fellow workers
Internet	All-round access to Information	Loss of active Knowledge	Arctic relevant basic education
	E-government	Loss of parts of self-government	Respect for Subsidiarity
	E-trade	Loss of jobs	Labour market and social policies
	Netbanking	Loss of traditional institutions	_
Computer management of production and distribution	New markets for small scale production and distribution	Loss of jobs	_

TABLE 2. EFFECTS OF GLOBALISATION

Globalisation	Enhanced or new Chances	Enhanced or new Risks	Enhanced or new Responsibilities
Less friction of distance	New markets abroad	More competition at home	Development of new comparative advantages
Liberalisation of the movements of goods and services, capital and labour	_	_	_

Photo: Kirmo Wilén / Leuku

TABLE 3. EFFECTS OF CLIMATE CHANGE

Climate change	Enhanced or new Chances	Enhanced or new Risks	Enhanced or new Responsibilities
Permafrost thawing	See below	Floods, coastal erosion and infrastructure damage	CO2 reduction, alternative energy production and comprehensive environmental policies
Sea ice thinning arriving late and breaking up early	Circumpolar Sea routes	Difficult hunting, fishing and transportation in the shorter winter	–
Unlocking of natural resources	Access to oil, mineral resources and precious metals	Non-sustainable exploitation of the natural resources Production and distribution taken over by foreigners	Licenses only to sustainable production Indigenous and local participation in projects

The most urgent problems of the North are technological development, globalization and climate change. Together they make us all stakeholders in the Arctic.

COURSES AND PROJECTS

Courses and Projects that are related to the Enhanced or new responsibilities indicated in tables 1-3.

Awareness of traditional culture:
BCS mandatory courses: People and Cultures in the Circumpolar World I and II.

Respect for subsidiarity:
BCS Advance course on Arctic Governance offered by University of Lapland.

Combination with Classroom Learning:
82% of BCS students in 2008 were taught in classrooms and 18% online.

Upgrading with Fellow Workers:
UArctic's Open Learning system.

Labour market and Social Policies:
Thematic Network on Social Work offered by Bodø University College, Norway in cooperation with Pomar University Archangelsk, Russia, Kemi-Tomio University of Applied Science, Finland, University of Regina, Canada and Finnmark University, Norway.

Development of New Comparative Advantages:
Thematic Network on Arctic Engineering and Science offered by Luleå University, Sweden in cooperation with University of Alaska Anchorage.

Photo: Kirmo Wilén / Leuku

CO2 Reduction, Alternative Energy Production and Comprehensive Environmental Policies:
These are the core elements of UArctic's Strategic Plan 2008-13 aiming for increased socio-economic benefit for the North, and by extension, global benefit by focussing on:

a. Building Human Capacity in the North, cultural relevant training and education for Sustainable Communities.
b. Adaptation to Climate Change: challenges for human society as well as for nature.
c. The North as an Energy Region: economic, cultural, environmental and technical opportunities, demands and impacts.

Licenses only to Sustainable Production:
Borealis Conference 2007, Building Capacity for Sustainable Production in the Circumpolar North arranged by Finnmark University College, Norway, UArctic and Norway Housing Bank.

Indigenous and Local Participation in Projects:
Thematic network on Community Based Natural Resource Co-Management offered by Sami University college, Norway in cooperation with indigenous institutions that are members of UArctic.

These developments and programmes demonstrate that the University of the Arctic is a necessary and effective tool toward increasing and applying knowledge in the Arctic region.

These developments and programmes demonstrate that the University of the Arctic is a necessary and effective tool toward increasing and applying knowledge in the Arctic region.

› *A party of hunters and scholars exchange knowledge in the field*

Photo: Yvon Csonka

› **LARS KULLERUD**
President of the University of the Arctic since 2002.
Former Polar Programme Manager for UNEP/Grid-Arendal (United Nations Environment Programme/ Global Research Information Database).
Academic background Precambrian Geology and Isotope Geochemistry, development of geostatistical methods for petroleum resource assessment, as well as assessments of the Arctic environment.

UNIVERSITY OF THE ARCTIC:

A network, a virtual organization, a real force, and

A REALITY FOSTERING SUSTAINABLE DEVELOPMENT OF THE ARCTIC

THE ARCTIC AND THE WORLD

Today's world is more dependent on the North than ever – a dependency that will only grow in the future. The North represents invaluable resources, globally vital ecosystems, an important platform to conduct research and understand our dynamic planet, as well as a dream of a different land: a pristine part of the earth for the mind to explore. Seen from the south, the Arctic may be a frontier or a modestly relevant periphery rich in resources, but the Arctic also represents a fifth of the earth's surface, and is similarly important for its environmental contributionsto humankind. Sustainable development of this region is thus critical to the rest of the world.

The North has been a human habitat for thousands of years. For a few centuries it has been an arena for exploration, exploitation and land claims by national states. Recent decades have given us a melting of the political ice but also melting of sea ice from rapid climate change. The Rovaniemi process, which started in 1991, led to a unique partnership between governments and indigenous peoples to safeguard the Arctic environment and ensure the sustainable development of the region through what is now the Arctic Council. Now, eighteen years later, it is more imperative than ever that indigenous and national political leaders work in cooperation with local communities, academic institutions and the private sector to build a resilient and strong North.

CHALLENGES FOR THE NORTH

As a source of vital resources, the North for centuries has been managed as a distant 'colony' within each nation state. It has been a place where one sends experts, soldiers, doctors, managers, workers, priests, and teachers, while resources and young northerners are sent to the South. The new international cooperation, different types of local and self governance, and the establishment of new higher education and research institutions in the north, all show hope for a new future. The North can become a region which is able to provide goods and services globally on equal terms with other global regions.

The norths of the different Arctic States face many similar challenges. They need to build capacity for daily governance, develop human as well as natural resources in a sustainable way, create jobs and develop opportunities for their populations. Furthermore, they need to provide the world with vital resources like lumber, metals, fish, oil and gas, and services like transportation routes, pristine nature for recreation and local knowledge about the North, as well as opportunities for research vital to understanding the earth's ecosystem. These developments need to be done in a region with an extremely low population density, and a history of 'colonial style' management by the national capitals.

Unfortunately the North has generally been perceived as a periphery, and investments in education have historically been done from a 'help' and 'frontiers' perspective, even if there are shining exceptions in several countries. The governments of the Arctic countries have met the challenges of the north with school systems that are often identical to the systems provided in large towns in the south. Rarely have these education systems been adapted to local needs. Different kinds of higher education institutions in the North have been established, ranging from those focusing on training students for the local job market through professional education, to science based universities, often modeled on higher education institutions in the southern parts of the country.


Photo: Veli-Pekka Latinen

PRIMARY AND SECONDARY EDUCATION IN THE NORTH

There is a clear correlation between the level of education and income in the Arctic (Rønning and Wiborg 2008; Arctic Human Development Report 2004). An important observation is that both those completing a standard school system and those who receive good training in traditional skills through non-formal education have better economic prospects than those who drop out from traditional or ordinary forms of education. Not surprisingly, those who have higher education have the highest income in the communities (Poppel et al. 2008).

Arctic communities, and in particular rural areas, face high drop-out rates in primary and secondary school. Throughout the Arctic there is a history of education systems that tried to force central school models on local people, including different degrees of suppression of local language. This has been improved today in various degrees in the Arctic states. However, lack of skilled teachers with local roots, in particular in rural areas, is a common circumpolar challenge (Rønning and Wiborg 2008).

Despite exceptions the school systems provide an education modeled on western values and content. Local and traditional knowledge is most often valued in good-will speeches only and is not valued in admission to further education, jobs, or in evaluations of educa-

tion systems. Education is normally driven by central norms that poorly fit the local needs, and does not provide education and training relevant for local job markets. This leads to a continuation of the old system, with a high degree of unemployment, import of experts (often only short-term), and out-migration of youth. It is normally women who leave and men who stay behind, leading to many social problems.

It is time for a shift from viewing knowledge as a standardized commodity to seeing it as a flexible resource. Decentralization of control and decision-making in education is needed, as are local adaptations of curriculum, and increased use of alternative approaches to access knowledge from any place at any time (Rønning and Wiborg 2008).

HIGHER EDUCATION CHALLENGES IN THE NORTH

To deliver higher education in the Arctic includes addressing two major challenges; Globalization of Higher education and at the same time to provide relevant education as seen by the students and the communities that normally pay and benefit from the education and research.

Map: © University of the Arctic 2009, Philipp Rekacewicz, Veli-Pekka Laitinen and Hugo Ahlenius, Nordpil

Photo: Delta Junction, Alaska/Amanda Graham

There is a global trend towards bigger units and more centralization both in the private and public sectors. This is a general challenge when one aims for sustainable development of the sparsely populated Arctic region. This trend is also evident in higher education: larger universities provide the benefit of more comprehensive programming, the ability to develop world class research in some areas, and the capability to promote themselves in a competitive research and education market. This strategy, based on the need to be robust, dynamic and well-known in one's own right, is resource demanding and therefore a driver towards larger entities.

The less populated North cannot easily host comprehensive universities and professional education institutions of a size that can match these challenges. It is, however, not the total size of a university which deter-

mines its excellence in a specific area at a given time, as good research groups tend to be modest in size. This can be illustrated by the fact that some of the most respected institutions in the world are rather modest in size, but have instead maintained focus and quality over time.

The challenges of delivering quality, and at the same time addressing many needs can be solved by smaller institutions if they cooperate in networks, share resources, and divide roles in an efficient manner. A circumpolar network of smaller and larger institutions can form the critical mass for expertise in any field by their collective size. Through a well organized network, partnered universities will be better equipped than any single institution, even if the institution is large, to develop and maintain world class excellence in several disciplines as well as foster education, research and training that is relevant to sustainable development of the Arctic region.

Universities and Higher education institutions often state that they serve three main functions in society, Research, Education and Service to the society, often by doing the first two with some relevance focus. Research publications, infrastructure and labs, ability to get research funding, and student enrollment are normally the key parameters funding the institutions, and thus they often end up paying less attention to the role of serving their community. Many northern institutions are initially set up with the community as the primary constituency and are often stretched between the role of being relevant and the expectations of traditional academic excellence. Smaller institutions have less capacity to cover this dual role than larger ones. Cooperation is again a tool to address this, where high quality research may be carried out in networks while the institution then also can focus on serving the local needs. An important need in the north is to ensure that education is rooted in actual education and training needs, building on local and tradition forms of knowledge as well as the more common academic traditions. Many northern institutions have succeeded in filling this combined role and can further share and transfer this excellence in collaborate networks.

“The new international co-operation, different types of local and self governance and the establishment of new higher education and research institutions in the North, all show hope for the future. The North can become a region which is able to provide goods and services globally on equal terms with other global regions.

A new trend in higher education is students that focus on courses that fit their need and combine optimized education across institution boundaries instead of accepting the ‘package’ from a single institution. Such education ‘nomads’ challenge the traditional university which want to retain students as they represents income and the source of potentially excellent postgraduates to further research. By cooperating in a network, universities can offer packages across institutions, and thus keep such nomads within their network.

RESEARCH ABOUT THE NORTH

The global academic community has practiced international cooperation in Arctic research since the first Polar Year, 125 years ago. It laid the groundwork for a century in which the Arctic has become an increasingly attractive arena for scientific research. A general feature of research funding and polar research institutions is that the definition of the issues to be researched, and the provision of research funding by both private and public sources have been driven by institutions and experts located in more southern latitudes. The Arctic science community conducted a comprehensive bottom up process to identify a 10 years priority list of Arctic research needs leading to the International Conference

on Arctic Research Planning in Copenhagen in 2005 (ICARP II). This amongst other things clearly identified the need for improved understanding of the role of the direct drivers and actors in Arctic research, and acknowledged that the local people are underrepresented in this process.

The International Polar Year (IPY) now ending represents hope for a future with intensified research and increased attention to the Polar Regions, including a focus on human perspectives. The people of the North are no longer only an object of study; instead, indigenous peoples and other northerners together see the beginning of an new era where they can take active part in the development and governance of the region, and in defining the research agenda for the North, with 'shared voices'. After this IPY the global research community, in particular that located in southern latitudes that seeks to study in the North will benefit from partnering with a growing well-educated northern population and with the Arctic higher education and researchinstitutions.

UNIVERSITY OF THE ARCTIC

To address the above challenges the Higher Education institutions in the circumpolar north partnered with indigenous peoples' organizations and other organizations with an interest in capacity building in the north to form the University of the Arctic (UArctic). Together, through the added value of the network, they would be more.

UArctic allows for a dynamic development of the shared education systems through cooperation. Smaller learning centres can provide relevant quality education for people who seek higher education within their community or region, based on curriculum developed through circumpolar cooperation. The same learning centres may be developed to serve the infrastructure needs of shared research projects and thus benefit universities that do not have access to such infrastructure and secure coupling between 'bigger' research and local communities. A complete network in the Arctic Region can be a very efficient tool for delivering relevant curriculum, and cross institutional study paths for a changing North.

Practically all northern universities and colleges and many northern organizations engaged in higher education have come together in the University of the Arctic, currently a network of over 120 members. The leaders of UArctic higher education institutions have signed a declaration, the UArctic Charter, which demonstrates an unparalleled will to share resources and goals across national and institutional boundaries to ensure research, education and training in and about the North. The ambition is for a dynamic UArctic that uses its members' resources and capacity in a flexible and adaptive manner to meet the evolving needs of the North.

The University of the Arctic can be characterized as a virtual organization enabling network (not to be confused with virtual education). A Virtual Organization is a concept of organizing cooperation that has been researched extensively in computer science and to some extend in organization theory over the last decade (Camarinha-Matos et al 2005, Porter 2004, Lethbridge 2001). Virtual Organization models may be well suited to manage and understand the potential for cooperation among independent entities, like universities and colleges that share some common goals through an umbrella organization like the University of the Arctic. Such organization models allow flexibility beyond strict membership organization. Formally the University of the Arctic is a Virtual Organization Breeding Environment as defined by Afsarmanesh and Camarinha-Matos (2005) as it allow of multiple ways of cooperation within UArctic, each of the instances of cooperation being a virtual organization. The concrete instances of Virtual Organization cooperation in UArctic includes thematic networks, development and delivery of joint and parallel degree programmes, shared undergraduate programmes, and UArctic Institutes.

UArctic members are ready to take a collective responsibility as leaders of research and education relevant to northern communities both to serve the North's internal needs as well as the equip the North with the capacity to serve the rest of the planet. The University of the Arctic is for example ready to take the lead in providing stewardship for a sustainable long-term legacy of the Polar Year by promoting both western academic traditions as well as traditional and indigenous knowledge in the northern knowledge base. A goal we hope we share with the whole science community is that future leaders of polar science are just as likely to be recruited from the North as from today's southern based research communities.

Further, UArctic is committed to ensure that the northern universities and colleges become key players in the development and sharing of knowledge in and about the North and that such knowledge is based on indigenous and local traditional approaches as well as modern scientific methods to knowledge generation and sharing. Through UArctic and its members the North has the higher education opportunities needed to ensure leadership and competence to develop its own relevant strategies for knowledge generation and sharing, as well as for education to ensure sustainable development of the north.

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› *Ice floe at the Northwest passage in Canada*

Photo: Hans Strand / Scanpix

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ARCTIC IN CHANGE:

Prospects for Maritime Traffic

1 The Arctic is facing change: new opportunities but also new responsibilities.

At present the Arctic must for all practical purposes be regarded as a virgin area - with tremendous resources and possible new activities in the very near future. We are talking about an area with a rich and until now unspoiled nature, but also an area with vast resources which the world needs: energy (oil and gas), food (fisheries, other animals and organisms), and fresh water (melting ice). The Arctic is now substantially affected by climate change. There is of course discussions on how permanent the reduction in the ice coverage will be, in which areas and how accessible the Arctic will be. However, interested parties are now busy discussing new possibilities and activities, especially production of energy, new transport-corridors and harvesting of the rich fishery resources.

Fisheries are the backbone industry of coastal Norway. Over the past 35 years, Norwegian fishing has developed from an open-access, unregulated fishing activity to a thoroughly regulated industry. Measures like quotas and licenses are effectively used to prevent overfishing and depletion of stocks, and stocks of commercial value are strictly regulated. Many stocks are shared with other states and our cooperation with for instance the EU and the Russian Federation (Russia), based on the United Nations Fish Stocks Agreement, is essential. The Norwegian Government has a strong focus on fighting illegal, unreported and unregulated fisheries, particularly as regards cod in the Barents Sea.

Production of oil and gas is an activity of permanent character, involving heavy and long-term investments. The character of the oil industry is different from that of the shipping industry. Within the oil industry ownership and responsibility for activities are clearly identified and regulation and control of the activities is thus easier. When an oil field is to be developed or new platforms set up, the activities are usually based on the best known and available technology. In addition, challenges may be adequately analyzed in advance and appropriate precautions can be taken.

Maritime traffic is more flexible and adaptable, and it can serve both the oil industry and other needs. Any resources harvested (fish) or exploited and produced (oil and gas) in the Arctic will have to find its way to the world markets, particularly in Europe and America. This will lead to a substantial increase in transport

along the northern coast of Norway and other parts of the Arctic area.

In this article I will focus on new prospects for maritime traffic. Without legal structures and regulations for maritime traffic the consequence might be loss of life (crew and passengers), loss of ships and cargo, pollution/damage to wildlife, fish stocks and the environment in general.

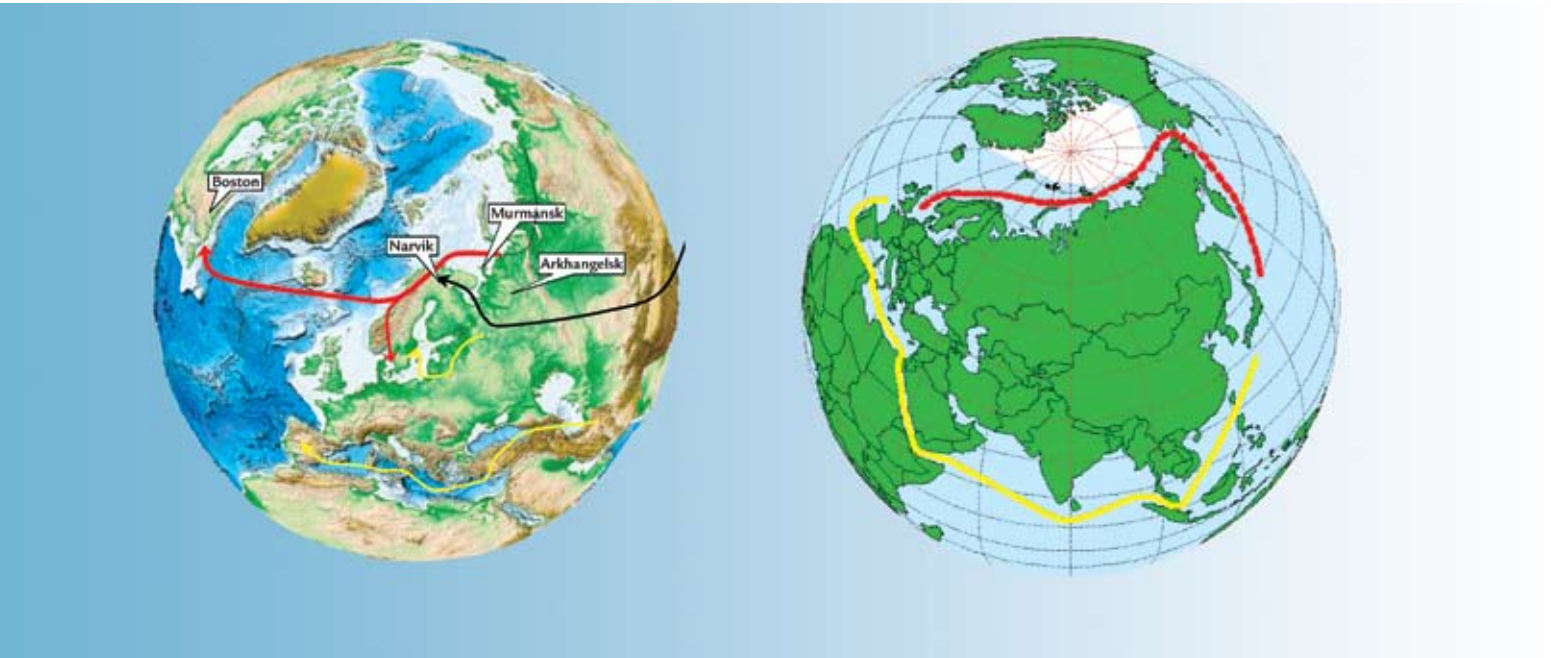
The United Nations Convention on the Law of the Sea (UNCLOS) provides the legal platform for all discussions and decisions regarding the Arctic. Thus, the necessary legal framework already exists, established by the global society through the United Nations. There is no lack of rules – rather a lack of policies. Since we are in an early phase, there is still time to discuss and clarify the fundamental issues involved. Governments are obliged to make decisions and give necessary guidance to commercial stakeholders, business partners and the public. A dialog with NGOs engaged in environmental issues is also required.

The Arctic Council (Russia, Canada, USA, Denmark, Norway, Iceland, Sweden and Finland) has noted the need for development and implementation of suitable national and international regulations and underlined the need for mandatory regulations for operations in Arctic waters (the Polar Code), oil spill preparedness and SAR (Search and Rescue). Denmark will chair the Arctic Council during the period 2009-11.

2 New transport-corridors?

All producers have a common challenge; how to transport and distribute the product in the most cost-effective, safe and secure way. If the owner cannot get the product transported and distributed – whether it is a new car, fish or energy/oil – it has no value. Only a few years ago the map in figure 1 was relevant as a point of departure for discussing transport between the Far East, Russia and Europe – and to some extent – the US markets, shown by the red arrow on the map. The black arrow shows the potential transport-corridor NEW (North East West Freight Corridor) based on existing railway tracks from western China to the port of Narvik/Norway – and by ship to the US East Coast or Europe. **Figure 1.**

› *Figure 1: The development of transport corridors*



› *Figure 2: The Northern Sea Route*

The Northern Sea Route and the Russian approach – and Arctic Climate Impact Assessment 2004.

Russia is committed to establish the Northern Sea Route (NSR) as shown in fig 2, along its Northern coast. **Figure 2.**

The melting of ice has opened this possibility, and the financial crisis has underlined the need for new transport corridors with lower costs. NSR connects Russia with Asia, Europe and USA. The negative features, however, are the shallow waters: Only smaller tankers and ships can be used, and all year shipping is presently not possible. NSR also passes through remote areas with little or limited infrastructure. The Panama and Suez transport corridors will of course remain important alternatives.

According to figure 3 from 2004 the retreating ice and opening of new corridors was not expected until mid century. Newer research shows that the ice is melting faster than expected. We have also learned that new interaction between weather changes, warmer winds and fast melting ice is expected to create an entirely new situation. Wind from Siberia forces the pack ice to Northern American shores. **Figure 3.**

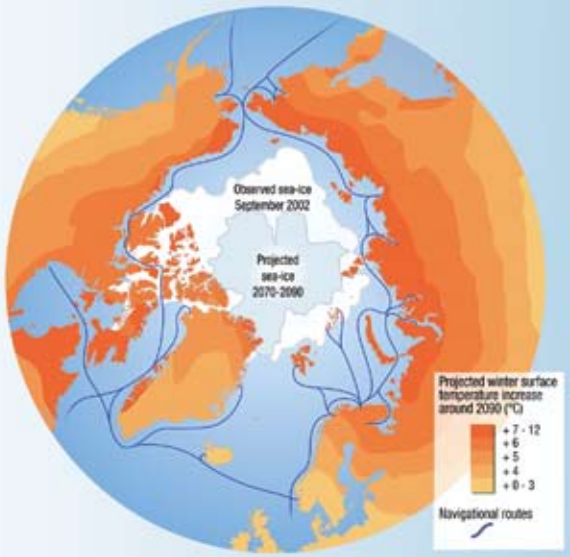
More icebergs are now appearing in the areas closest to the Northern part of Russia and Norway. Icebergs may be of quite considerable weight, and the speed at which they drift is surprisingly high. Consequently, icebergs have to be considered as a serious challenge for both permanent oil activity and shipping in the areas. This has to be taken into account when designing new platforms – it will not be possible to close down the activity to wait for an iceberg to pass. Ships are more flexible, but still vulnerable.

The consequence of climate change may eventually be ice free and open sea in the Artic, see **Figure 4** as an example.

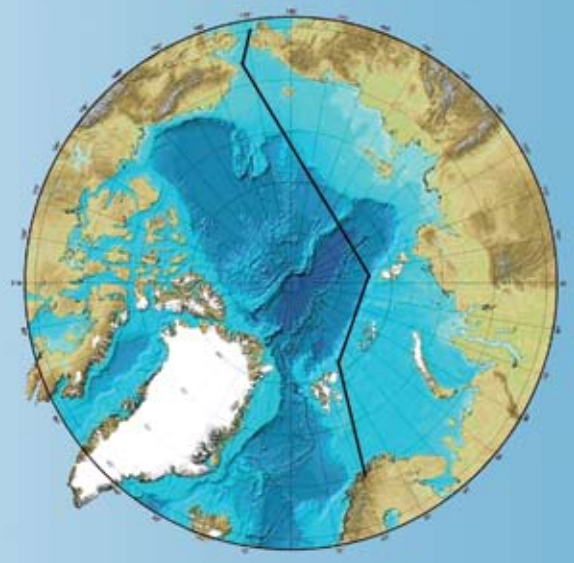
SOURCE: NORWEGIAN RESEARCH COUNCIL

- This will provide new possibilities for alternative routing which can shorten the distance between the Far East, Europe and North America considerably, for example:
- Yokohama-Bering Strait:
- 2200 nm = 4 ½ days at 21 knots
- Bering Strait-Melkøya (Northern Norway): 3000 nm, 6 days

› *Figure 3: AMAP-assessment*



› *Figure 4: September 2008 – Ice-free waters*



› *A Russian ship (Kapitan Sviridov) docked in the Port of Churchill, Churchill, Manitoba, Canada. It had carried fertilizer from Estonia and then loaded Canadian wheat to transport to Italy*

It will also allow transport corridors to be established outside the Russian territorial waters, implying that there would be no control, no fees and no shallow waters. This would however also imply that there would be limited monitoring and rescue preparedness, few people close to you and, consequently, a long response time in case of incidents or accidents.

Notwithstanding the climate change, the Arctic will remain an area with harsh weather conditions and complete darkness during parts of the year. It is important to emphasize the darkness both as a psychological and a practical factor: All year shipping might be very difficult, if not impossible. Since nobody would like to spend days in total darkness, we will probably not see the most extreme corridors used during winter when it is dark. Icing on the ship is another challenge for maneuvering and navigating. These factors are highly relevant when we discuss the rules for transport and other activities in the Arctic – new measures are needed.

3 New shipping activities?

A discussion on possible new activities in the vulnerable Arctic area must take into consideration the character of the future shipping activity and the safety and security measures that can be taken, both from a practical view and a more formal and economic perspective.

Due to prevailing conditions in the Arctic it is not possible to establish an infrastructure similar to the well-known and traditional systems used in other areas. It means that: the ships have to carry most of the equipment needed and be designed to navigate this area;

- *aids to navigation has to be adjusted to the special challenges in the Arctic,*
- *monitoring and surveillance of the traffic will be of outmost importance,*
- *SAR (search and rescue) has to be established and*
- *the role of the public versus the private responsibilities, funding/insurance and interest has to be addressed and defined.*

The *types of ships* required in the Arctic are already available. A ship's lifetime is 25-30 years. It means that there is a risk that old and not adequately equipped vessels can be used, unless we adopt special requirements for ships navigating in this area. We have to

focus on the design and equipping of ships and on the education and training of crews, preparing them for handling a ship under these very special conditions, e.g. with icing and darkness. In this regard the IMO work on the Polar Code is very important. Some nations have problems accepting binding rules for Polar navigation, but I hope we will see substantial progress on this matter very soon.

Ownership and insurance are other important elements to be considered before increased sea transport should take place in these areas. Unfortunately, problems have been experienced related to identifying the real and responsible ship-owner, establishing sufficient insurance and the division of responsibilities between the ship and the coastal state. Dialog with insurance societies might give important indications on how the risks are assessed, and the rules and regulations concerning limitation of compensation for oil spill and other damage should be addressed and elaborated. Should we stick strictly to the polluter-pays-principle, or should the burden be shared in some way between involved partners?

How does one handle 1,000 people or more left on an ice float? Even in summertime the air temperature is as low as 0-10 C and in the water it is around zero.

Which forms of *shipping and sea transportation* can we foresee in the Arctic? The tourism industry is expected to take advantage of the new opportunities in the area and for example sailing *cruise ships* to the North Pole. One must remember that there is no maritime infrastructure or adequate navigational aids in large parts of the Arctic – and more important no SAR. In a case of shipwreck in the Arctic time will be of essence. Norway has relevant experience from Svalbard, where major tourist ships with up to 2,000 passengers come every year. How does one handle 1,000 people or more left on an ice float? Even in summertime the air temperature is as low as 0-10 C and in the water it is around zero. Reporting systems and safety regulations are the primary tasks. Stricter regulations regarding design and equipment of ships sailing in the Arctic is one way. A rather simple and easy way is to demand that ships sail two and two together in this area.

Will we see *container ships* using the new routes? I think these routes will be uncertain from a commercial point of view because of cold climate, darkness, lack of mapping, infrastructure and training. Much has to be accomplished before the conditions for sea transport along the Artic routes can be a real alternative to the existing routes for East-West shipping. Are the ship-owners willing to invest in these new transport routings?

As a coastal state with significant fisheries and oil and gas activities, Norway has a particular focus on the ongoing *sea transport of oil and gas* from fields in the Barents Sea. An additional challenge in Northern waters to shipping in general, is the present need for transfer of oil from ship to ship at sea. The reason is that the Russian oil fields currently under production or development are generally located in areas of shallow waters, allowing only the use of tankers up to 50,000-70,000 GT (GrossTon). Accordingly, transfers have to take place either in Murmansk, Norway or along the coast on the way to the markets.

Photo: Kirmo Wilén / Leuku

Photo: Kirmo Wilén / Leuku

The first shipments from the Russian fields and the transshipments at Varanday started in 2008. So far, no particular problems have been experienced, probably because of the strict requirements to the ships used imposed by the Russian Government and the sellers and buyers of the oil. The states involved have their respective responsibilities, and effective bilateral cooperation has proved to be of great value. The cooperation between the Russian Ministry of Transport and the Norwegian Ministry of Fisheries and Coastal affairs covers both safety at sea and oil spill preparedness.

4 Measures and regulations

As both a coastal state and a flag state, Norway is working to ensure sufficient and adequate measures and regulations relating to sea transport. An important point of departure is risk analysis. Knowledge, data, research and experience must form the basis for finding the right solutions and making the right decisions. The Government has systematically conducted risk analyses in the northern part of Norway; the White Paper no 14 (2004-05) On the safe side (affordable preventive measures and oil spill preparedness), the integrated management plans respectively for the Norwegian part of the Barents Sea and the Norwegian Sea (strategies for coexistence between oil and gas-, fisheries- and shipping activities and the environmental concerns). The Government has recently provided a strategy document concerning the High North, " New building blocks in the north".

The measures may be divided in escalating groups. Preventive measures to avoid incidents and accidents are the primary element (e.g. pilotage, VTS Vessel Traffic Service, routing). Total avoidance is largely beyond reach, since human failure is a contributing factor in up to 80% of the incidents and accident. Preparedness is the second element, consisting of measures to reduce the damage and the consequences if the preventive measures fail (e.g. tugboats, depots with equipment). The third element in the "package" is the plans for prompt and adequate reaction to an incident or accident.

Urgent measures:

4.1 The IMO Polar Code

IMO Maritime Safety Committee has decided to provide the Assembly with a proposal for Guidelines for ships operating in polar waters. A mandatory Code covering the full range of design, construction, equipment, operational, training, search and rescue and environmental protection issues relevant to ships operating in such waters has been discussed. In that context the proposal has underlined that the regulation generally should apply to new ships, "so there should only be a limited cost and administrative and legal burden in this regard". Restriction and additional and/or enhanced equipment measures may be developed and applied to existing ships if deemed necessary during the review. A proposal for a mandatory Code supported from Denmark and Norway was not approved. Subsequently there is still some way forward before a binding Code and regime for all ships operating in the Arctic is established.

4.2 Aids to navigation

It is difficult to obtain reliable systems based on traditionally aids to navigation in the polar area due to ice and climate and the insufficient hydrographic surveys. The routes have to be flexible and able to be shifted at a short notice due to ice and local hydrographical conditions. Buoys and other installations may be damaged and moved away by ice etc. Thus development of virtual aids to navigation should be given a priority.

The virtual aids to navigation should be applied in combination with radio navigation aids and based on the real-time picture of the local situation in the area. Establishing of electronic rather than conventional means such as implementing GNSS (Global Navigation Satellite System and AIS (Automatic Identification System) and AIS satellite communication should be considered. Exchange of data from AIS and ship reporting systems will need to be carefully considered. The knowledge of the problems with GPS and other similar

satellite systems in the high latitudes also has to be taken into account. Pilotage might be an appropriate measure in some areas and at some times of the year. It is of the outmost importance that such new methods to mark the safe waterway is internationally coordinated and agreed in order for the mariners to experience only one system. IALA (the International Association of Lighthouse Authorities) is an appropriate international organisation. Both Denmark and Norway take part in the IALA.

Monitoring of sea transport activities and routing measures are important tools. A combination of monitoring and routing measures will probably be two of the most important measures in the Arctic, particularly when it comes to search and rescue (SAR). The region will probably need SAR measures, and hopefully such measures will be established through cooperation between involved nations.

In the territorial sea coastal states may require foreign ships to use designated sea lanes and traffic separation schemes. Until recently there has been some reluctance towards accepting such measures in international waters. The adoption of the routing system north of Norway implies new signals in this regard. With the support of Russia, and with the US as a positive partner, Norway has established a ship-routing system off the coast of Northern Norway. The system which was approved by IMO and implemented as of 1 July 2007 pushes the traffic further away from the vulnerable coastline and thereby gives more time to respond in case of emergency along the coast, particularly in cases of oil spills.

Our point of departure should rather be that the challenges will gradually be overcome due to the fact that the Polar region is rich in natural resources and can play an important role as a transport corridor.

Located 30 nautical miles off the coast, the system is 560 nautical miles long and consists of 8 mandatory traffic separation schemes, connected by 7 recommended routes. The routing system applies to tankers of all sizes and all other cargo ships of 5,000 gross tonnage and upwards, in transit or on international voyages to or from ports in Norway. The system allows the Norwegian VTS (Vessel Traffic Service) in Vardø to follow the movements of oil tankers and other ships sailing in these harsh waters, thereby reducing the risk of accidents and pollution from ships.

› *Figure 5: The Vardø-Røst routing scheme*

4.3 Surveillance and monitoring

In Arctic waters monitoring and surveillance will be one of the most important preventive measures. It is an advantage that such systems can be operated at long distance, but it is challenging to combine both existing and new systems and regional and global systems. With the expected increase in activities such as shipping and fisheries, there is a pressing need for regular exchange of information in advance of activities and movements in these areas. Instruments for reporting, monitoring and surveillance of the maritime activities in these waters are needed. Systems for tracking have long been used for the commercial fleet, and such systems have now also been developed for use by the public maritime authorities in the form of a long range tracking and identification system (LRIT).

The AIS-system has a coverage of 30-40 nautical miles off the coast, which is not sufficient for conditions in the Arctic. Implementation of the IMO LRIT will provide supplementary coverage. Pilot projects and initiatives for satellite based AIS monitoring, is very relevant for the Arctic. The IALA-net (AIS Data Exchange) is an interesting and important data-sharing initiative by the USA, under development within IALA. Both Denmark, Norway and now also China participate.

Norway is presently working on a new system, the Barents Watch, with the purpose to gather data from various sector-systems and make real-time and historical data and information available in one system.

Reliable positioning of vessels is a prerequisite for both safe navigation and maritime traffic monitoring outside the range of coastal radars. The Global Navigation Satellite System (GNSS) is important for all modern activities, especially for activities depending on critical infrastructure. Today the American system GPS is the primary system for civil use. A new European system – Galileo – is under establishment, and the Russian system GLONAS is in operation. China has similar systems, but not for a worldwide civil use. Based on a study from 2001 it is obvious that additional satellites would be needed in order to ensure adequate coverage in the Northern areas.

The terrestrial based radio-navigation system Loran C is still functional in the northern hemisphere in Europe (Norway, UK, France), in the Far East (China, South Korea, Russia and Japan) and in the USA. Russia and Norway has in June 2009 agreed on the establishment of a joint radio-navigation service in the Barents Sea, based on the Norwegian Loran C chain and the Russian Chayka in a Joint-Boe-Chain. At the meeting the parties stressed that climate change offers new challenges, possibilities and responsibilities for the maritime activities in the Arctic, e.g. the development of the Northern Sea Route and the need for reliable information about the Polar basin. A combined Chayka-Loran C chain may play an important part in the coverage of the circumpolar area.

4.4 SAR and oil spill preparedness

The primary task if an accident occurs is to save lives of passengers and crew. The most important measures for reducing the damage and action if an incident/accident occurs are SAR. This is stressed by all involved nations and organisations.

Secondly, the task is to prevent oil spills or other pollution and to reduce any damage. All ships are carrying bunkers, and for long journeys without ordinary access to refueling, ships will carry extra reserves. Development of technology for handling of oil spills in areas with harsh weather conditions is a serious challenge and a joint responsibility for all states in question. This is an important area for bilateral cooperation between Norway and Russia. In the Polar area there is no adequate infrastructure readily available to handle incidents of oil spills. Thus, an instrument for cooperation on response to accidental oil spills in the Arctic should be developed.

Concluding remarks

It is clear that maritime traffic and other activities in the Polar area will face great challenges. A realistic view is that these challenges will slow down any immediate development, but they will not imply an indefinite postponement of future development in the Polar region. Our point of departure should rather be that the challenges will gradually be overcome, due to the fact that the Polar region is rich in natural resources and can play an important role as a transport corridor. In my opinion, the next step for responsible governments should be to develop the regimes necessary to meet the challenges created by increased use of the Polar region. Quite another question is whether the interested industries are prepared to cover the substantial investment and cost involved if the new opportunities of the Arctic be fully exploited.

Photo: Veikko Vasama / Leuku

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The Challenges in the Arctic:

CLIMATE CHANGE AND/OR SOCIAL DEVELOPMENT?

By now no one doubts that the climate is changing and that both in the short, and especially in the longer run, that reality must be reconciled with social developments. The special conditions in the Arctic are recognized as especially critical, and that gives leading politicians the opportunity to appear at ice-filled fjords and splitting glaciers to stimulate the collective conscience while they express concern for the communities that must live with the changes.

Many fewer are aware that the current situation can perhaps be worsened and the process of change accelerated because of irresponsible human activities. Climate changes in the regional environment are, however, by no means unprecedented. Nature is always changing around us, and these changes are seen most clearly in marginal regions like the Arctic. Only a few ask whether these climate-related changes will actually be so significant for the changes facing people in the Arctic region or whether quite different transformations are in play.


Photo: Jorma Luhta / Leuku

REACTION TO DYNAMIC NATURE

The development of Greenland during the last century is a good example of a changing environment, but that society has been able to handle these changes. A dramatic rise in the sea temperature in the 1920s had drastic consequences for the island's basic resources. Cod appeared in Greenland's coastal waters and within a decade became the dominant sea resource. Until the end of the 19th century Greenland's economy had been based mainly on seal hunting which then faced a worsening crisis in part because mineral oil had replaced the previously profitable trade with oil produced from sea mammals, and in part because increasing population around the trading posts had put severe pressure on local resources. As a result economic development of fish trading was underway, and the dramatic rise in cod sources was an important element that among other things led to the establishment of several new settlements and processing facilities where the new resources provided the best locations and conditions.

In the 1980s the sea temperatures changed again this time falling, which meant that the cod could no longer reproduce in local Greenlandic waters. As a consequence the cod disappeared within a few years. Shrimp fishing, however, had in the meantime become the most important ocean resource, and it now was intensified and concentrated in several towns in West Greenland. Several villages that had relied on cod fishing, therefore, now lost their economic foundation.

During the 1980s and 1990s fishing for halibut was on the increase in part because of the new temperature conditions in the sea, and the fishing grounds have since then moved slowly toward the northwest such that towns and villages in northwest Greenland which were previously oriented toward hunting now have an active fishing industry. On the other hand fishing further south has generally ceased, and many fishermen in south Greenland anticipate a future rise in sea temperatures which would recreate the favorable conditions for cod fishing which was the original economic basis for of the region.

HOW TO ASSESS THE CHANGES?

As the previous description indicates, there is no single view among Greenlandic hunters, fishermen, and herdsmen as to what climate changes will mean for the country's future. Older hunters in north Greenland see the melting of sea ice as a problem when they go on traditional hunts, for example, for narwhales. The younger hunters and fishermen on the contrary see the melting as an advantage as the halibut increase in number, the cod may return, and that would provide them with

much better earning opportunities than the traditional hunts. In south Greenland the sheep herders hope for new opportunities to grow vegetables and potatoes, and the fishermen are encouraged about the improved cod catches.

What is important is for one to be – as one always has been – open to the challenges the changes present and to seek the best responses. That does not mean abstaining from discussions about the fate of polar bears or other more prominent species tied to the Arctic environment. However, for example, it is very rare for the discussions to consider the unfortunate consequences resulting from the thawing of the permafrost, which is mainly because Greenlandic building codes for the past half century have limited such problems to relatively few cases. Therefore the environmental consequences of climate changes are not a central part of concerns for the country's future.

In this regard Greenland differs from other parts of the Arctic. Several issues have been highlighted in the press in recent years including the villages of Kivalina and Shishmaref both of which lie in northwest Alaska. These settlements are situated on a sandbar at the Chukchi Sea and Berling Straits, and are protected by the sandbar's location on the permafrost and the sea ice's sheltering from the erosive action of the sea. The partial melting of sea ice and the thawing of the permafrost during recent years, however, has resulted in severe erosion, which in turn has required that parts of the villages be moved. An airfield built in Kivalina in the 1960s has been a special problem as it is much more difficult to move runways and large fuel tanks than individual houses. A common cause of many of the problems that arise in parts of the Arctic but which are not serious in Greenland stem from the lack of a planning tradition. A 250-year history of colonial rule has doubtlessly left many problems for the Greenlanders which first the Home-rule and now the Self-rule government must tackle. It also left, however, a legacy of planning experience where both probable and unexpected changes in nature are part of the physical planning process, and which is not normally the case to the same degree in other parts of the Arctic.


Photo: Robert Harding / Scanpix

WHAT IS THE SOURCE OF CONCERN?

There are other things of current concern in Arctic societies such as the increased activities expected in the region with and without climate changes as well as the economic and social challenges the societies otherwise face.

Photo: Ivars Silis

The search for energy and mineral raw materials are continuing at an increased tempo, and previous discoveries in Arctic areas that were previously of limited attraction are now of greater interest. This is in part because the reduction in ice cover makes the resources more accessible, and the opportunity to use Arctic coastal waters for transportation are becoming not only possible but potentially profitable. A major problem with these extraction and transportation activities is that in the best of circumstances their regional employment and income opportunities are short-term. It is fine while earnings occur but it will create problems when after a number of years they disappear again. There is also a risk that after a period of intense exploitation the region may have to cope with large quantities of mine wastes, oil spills, landscape changes, and environmental changes which suddenly occur but which will take decades or even centuries to recover.

Increases in the level of economic activity have additional negative consequences. Disturbances of sea environments can result in unfortunate effects on traditional hunting quarry as well as greater dangers of collisions between transport vessels and fishing boats. There are also greater threats of oil spills and other forms of pollution to the sea environment. Similarly increased fishing in the Arctic Sea may impact ecosystems which now make possible a certain level of hunting and fishing in the region but which may face unexpected changes not only in the seas but also on land.

Without a doubt many of these activities and developments are affected by climate changes. Fundamentally, however, they are human activities under human control – but not under the control of those most affected by the changes!

In 2007 there was an important meeting in Ilulissat, Greenland between the Arctic coastal states (USA, Canada, Denmark – on behalf of Greenland, Norway, and Russia), at the initiative of Danish Foreign Minister Per Stig Møller. The meeting's participants recognized that the UNCLOS "Law of the Sea" provided an international legal framework with sufficient scope and detail to solve possible conflicts arising from the increased activities. That was undoubtedly true for the affected states, but it is the nature of international admiralty law that it regulates and applies only to "states" and not "people." Thus it excludes a large constituency, namely the indigenous people who in various ways are dependent on Arctic resources, from having a legal right to participate in the decision-making about future exploitation of resources and sea routes in the Arctic. The closest it comes to small scale fishing and hunting is in UNCLOS' section on "Straddling and Highly Migratory Stocks" where mention is made that decisions on for example the allocation of quotas and regulating access to certain species should take into account "artisan fisheries," that is, small-scale local fishing. It is, however, a long way from such references to consideration of the importance of hunting and fishing for the indigenous population residing in the Arctic. In the context of the EU attention is given to the concept of "Subsidiarity" as a guide that decisions should include and take into account the interests of those affected by them. The extent to which this actually occurs can be argued, but the principle is often raised in discussions about the necessity of closeness in decision-making. It is the same principle of closeness which representatives of the indigenous people want to be part of the procedure when decisions are made about the use of resources and transit routes in the sensitive Arctic region regardless of whether they are national or international. History shows that the unfortunately national governments have rarely protected the original local population's interests.

> *Even if the current changes have many more dimensions than previous ones, there is evidence that eventually these societies will be able to accommodate these changes. And in the end it will be the human resources of the Arctic that are decisive.*



Photos: Eric Baccega / Juan Carlos Muñoz / Ioseba Egibar / Scanpix

THE SOCIAL CHALLENGE

Exploitation of sustainable resources through fishing and hunting has been the economic foundation of most northern societies. Over time such production has become continuously required less labor and been less profitable not least because of rigorous competition on the world market such as with coldwater shrimp in the North Atlantic which today must compete with similar shrimp species from the South Atlantic as caught in Chile, or with warm water species farmed in Southeast Asia or South America. These can be harvested in 7-8 months while North Atlantic shrimp as a rule require more than 7-8 years to reach the size desired by customers. In addition high labor costs causes processing jobs to be moved in part or entirely to large offshore trawlers at sea or to Asia or other low wage areas.

Production of traditional foods continues to be of economic, social, cultural, and symbolic importance to many northern societies. In some place such as Greenland it has been possible to couple traditional foods with commercial opportunities such that Greenlandic products are available in local markets and in distant supermarket freezers. In other Arctic areas such as Canada trade with local products is forbidden. The goal is to maintain local products as part of the social economy in native communities, but the result has been that such products are gradually disappearing because supermarket which stock only imported products from the south on their shelves are becoming the main supplier to households.

Local resources are still play a role for the Arctic population, and roughly 5-10% of the population is employed in the primary sector (hunting, fishing, and mining) while another 10-15% are employed in processing industries, construction, and the transportation sector. It also means that the tertiary sector – the service sector with salaried employment in administration, education, social service, etc. have become the largest source of income for most families. That presents rising demands for both new structural resources and willingness to restructure. To take advantage of the new opportunities requires new skills, not least in further education and training.

Women have been especially successful in acquiring these new skills and attitudes both in accepting new jobs outside of the traditional sectors and in pursing education leading to new qualifications. Despite an ideological resistance in many Arctic societies, most of the income of hunters and fishermen come from other trades, and women often are the largest source of household income. In Greenland more than 70% of the professional hunters and fishermen have income from other employment. In more than 50% of households women provide the largest portion of income. Not rarely this female income gives sorely needed support to investments in hunting and fishing gear and thus to maintaining the activity. The importance of such alternative employment possibilities is not always recognized in part because decisions in Arctic societies are still dominated by men. Their values still dictate that if new jobs are required, they must be in the good old jobs, i.e. fishing and hunting. That means that jobs that can attract and keep women in the villages and small towns are not encouraged.

RESPONSE TO GLOBALIZATION

Clearly women are able to respond better to the challenges of globalization than men. They pursue education, they pursue cultural challenges, and not least, they pursue occupational challenges. Since none of they challenges can be obtained in small settlements, many women see no alternative but to seek opportunities elsewhere. This means initially the larger towns in the region. Then they move beyond regional towns to major centers such as the capital, which in Greenland is Nuuk (Godthåb). If this does not satisfy them, they move outside the country. This is "stepping stone" mobility where improved skills and qualifications lead them to seek greater opportunities.

This is true not only for women, especially young women, but also for young men. Many men are not, however, able to accept the necessity for change and development. Many have avoided training and education for new skills and are thus tied to traditional occupations and employment in those jobs. The consequence is a notably skewed division of the two sexes in Arctic societies. This typically results in a severe shortage of young women in small settlements, a small surplus of women in the larger towns, and finally a net emigration of women from the entire Arctic region.

Clearly women are able to respond better to the challenges of globalization. They pursue education, they pursue cultural challenges, and not least they pursue occupational challenges.

This skewed division contributes to serious social problems in the smaller villages. Without suitable marriage partners many young men initially lack a social catalyst for their existence. It is usually women who are the supportive element in local society, and without them social interaction suffers. Without a second income men also face economic problems because hunting and fishing can rarely provide for a decent daily living standard and for investment in necessary equipment. That means that young men become dependent on their parents whose pensions can contribute to these traditional occupations. However, it also causes frustrations and anxieties which often results in drunken and violent behavior. This in turn contributes further to the flight of women from these settlements.
Many believe that such differences in behavior between men and women have genetic causes. However, in the Arctic context there is clearly a close connection between behavioral patterns and upbringing. Girls are constantly required to perform tasks inside and outside of the family, but that is rarely the case for boys. Although men seem to be satisfied with a single shop that provides the basic necessities including the latest action films on videos and a snack bar which supplies hamburgers and pizza, women develop broader and more demanding consumer tastes. They want variety and choice in social and cultural opportunities including wider shopping options, a larger offering of cafes, theaters, art galleries, and similar facilities that meet modern expectations.

AND THE FUTURE?

Arctic societies are in a very difficult position because they are pressured from many directions. From outside because the search for raw materials and energy resources increasingly affects them without their real participation, while globalization offers new opportunities but also presents new demands. Internally because these changes require an ability to accept and an infrastructure to provide support for transformation which is a very difficult process requiring much effort from within and beyond the local society. In this context the impact of possible climate changes is a relatively modest factor. On the contrary history demonstrates that Arctic societies have previously managed to transform themselves. Even if the current changes have many more dimensions than previous ones, there is evidence that eventually these societies will be able to accommodate these challenges. And in the end it will be the human resources of the Arctic that are decisive.

Photo: Robert Harding / Scanpix

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SUSTAINABLE DEVELOPMENT IN THE ARCTIC *– from concepts to reality*

Climate changes issues and the extraction of oil and gas are having profound impacts on development of Arctic areas. The severity of the impact of climate-related changes on human development will to a large extent depend on whether the international community will be able to mobilize the necessary political will to reduce the anthropogenic factors contributing to global warming in the immediate future. That is still an open question. With a world economy continuing to be highly dependent on petroleum it is likely that oil and gas drilling and related pipelines and sea transport will increasingly set their deep marks on development of the Arctic. This future scenario will have significant consequences for the livelihoods of people in the Arctic areas. What choices may provide alternative pathways that balance progress and a sustainable development framework?

Recently Mr. Kuupik Kleist, newly elected Prime Minister of the Self Rule Government of Greenland, was quoted as saying that the climate change crisis provides both threats and opportunities for the Arctic (The Economist, July 18, 2009) On the one hand, receding icecaps and rising sea levels will affect the natural resource base and change the lifestyles of local people. The melting permafrost will harm roads and runways. On the other hand, the Economist article mentions that warmer climates will provide new economic opportunities, such as tourism and sea transport, and they will ease the drilling for oil and gas. The latter would provide powerful boosts to Arctic economies. It will also substantially increase their political clout. Home rule government in Greenland may soon move to full independence from Denmark if oil and gas revenues provide a budgetary basis for doing so.

The big question is not whether major changes will take place but rather the magnitude of these changes and how disruptive they will be on Arctic people and culture. Is a sustainable development path possible?

The concept of sustainable development has been developing gradually over the several decades. A major international reference point has been the report of the Brundtland Commission, “Our Common Future”, in 1987. Prior to that time World Conservation Union

(IUCN) made important contributions to our understanding of sustainable development, in particular in its World Conservation Strategy of 1980. The essence of this concept is the need for environmental, social and economic issues to be considered in an inter-connected manner in order to ensure that our natural resources are managed in a sound and sustainable way.

The perspective of sustainable development is long term – it takes into account the inter-generational consequences of how we use of our natural resources. It is also holistic in that it requires inter-disciplinary methods of knowledge gathering and assessments. Provisions for the participation of local people and their communities in the planning and implementation can buttress chances for effective realisation of sustainable development. Their interest and commitment may help to ensure that sustainable development is effectively put into practice.

Sustainable development has now become an often-used term in discussions about global development and in the global environmental conventions. It has become a standard reference point in many international agreements. While this concept appears to have broad political and public acceptance, it has not been easy to put it into practice.

Experiences from the implementation phase of several environmental conventions and from many of the environmental activities funded by the international development agencies have demonstrated such difficulties. Setting aside protected areas and agreeing on the need to prevent the extinction of threatened species are areas where some solid achievements have been made. However, solving environmental problems in a larger sustainable development context has been difficult. In particular it has been difficult to implement principles related to the sustainable use of natural resources such as flora and fauna. Without a sustainable use provision it is highly unlikely that many if not most of the developing countries would have joined the environmental

Photo: Kalervo Ojutkangas / Leuku

conventions. Yet, formidable opposition to sustainable use can be found in many of the environmental groups in high income countries and among some governments that they seek to influence. For people living under difficult economic and social conditions such opposition from environmental groups can undermine their development aspirations and cause considerable resentment.

The UN Convention on Global Biodiversity includes the principle of sustainable use of natural resources. This states that sustainable use "means the use of components of biological diversity in a way and a rate that does not lead to the long-term decline of biological diversity, thereby maintaining its potential to meet the needs and aspirations of present and future generations."

It seems far easier to gather support in high income countries for total ban of use of natural resources, especially wildlife, than it is to take the time to listen to scientific evidence and thereafter figure out when the use of a natural resource can be judged to be sustainable or not. This requires scientific and technical expertise. The global environmental conventions include scientific panels in their governance systems but quite a number of member countries still seem to prefer to fight this issue on mainly political terms.

It is important to consider carefully the basic principles of sustainable use. Economic bans are appropriate in exceptional circumstances when they relate to species that are threatened by extinction. However, they are very blunt instruments that can hit quite indiscriminately a wide variety of parties, even those that seek to practice sound sustainable use of natural resources. On my travels among Inuit peoples of Greenland I have encountered heart-wrenching cases of innocent communities being hard hits by bans on seal hunting, when they are in fact fully abiding by internationally acceptable sustainable use principles. Indeed they consider these essential to the long-term future of their communities and to the resource needs of future generations. Sustainable use is a key parameter in the sustainable development paradigm. It is about managing the use of wild species and ecosystems so that it falls within biologically sustainable limits.

Operational judgments about sustainable use must be science-based. Today there are ample opportunities to get both scientific and technical advice of how to measure and assess biologically sustainable limits. Among these are the scientific specialist groups under the Species Survival Commission of the World Conservation Union (IUCN). Political leaders and decision-makers ought to get strong scientific advice before they legislate or otherwise promote bans on the economic or social use of wildlife.

Whichever methodology one chooses to investigate, to collect information and to make assessments of sustainable development, it will be essential to bring together the professional contributions from each of its three main pillars of sustainable development – economists, social development specialists and ecologists. Their contributions need to be considered in the same overall context. It is not a task of experts from a single discipline. Economists alone cannot be expected to take fully into account the relevant social and environmental issues, nor can ecologists alone be expected to take into account the economic and social issues. Team work must involve professional expertise from all three areas of expertise. Only then will the final product have a chance to become trusted by those concerned and to gain broad credibility by decision-makers as well as the public at large.

"Home rule government in Greenland may soon move to full independence from Denmark if oil and gas revenues provide a budgetary basis for doing so.

The traditional university system often seems to have difficulties in supporting holistic or multi-disciplinary research. For one thing our academic traditions make it

difficult to advance knowledge about broader issues since they tend to favor specialist research subjected to peer review procedures that involve their own kind of expertise. Universities allow the various disciplines considerable freedom to pursue their own interests. Fragmentation of research can become an obstacle for policy-making and decision-making. Seldom is interdisciplinary research give much prestige and access to funding in university budgets.

Things are changing. A growing number of research institutions have taken note of the danger of excessive fragmentation of research. They have understood that working within one single discipline can severely limit the opportunities of moving sustainable development from the conceptual stage into reality and providing effective policy guidance. Today there is better understanding of this important point. It gives some hope for the future.

Yet, academic research alone will not be sufficient to ensure that attractive concepts can be turned into practical results. Local knowledge and community participation will also be important.

Since its establishment in 1998 the Aarhus Convention (under the UN Economic Commission for Europe) has gathered some interesting experiences on access to information and public participation. When local communities are engaged in the process of collecting information used for policy and decision-making, a strong sense of ownership in the process can be generated. This can lead to better understanding and more trust in the reliability and the meaning of the eventual findings and results.

Another reason why sustainable development is difficult to put into practice has to do with the time dimension. The involvement of local populations in the information-gathering processes can help emphasize a long term focus. Political leadership is important but politicians also tend to emphasize short-term results. Popular participation in discussions and information processes can reinforce the longer term perspectives of politicians as well as government officials. Experience from past success in reducing acid rain in Europe underscores the importance of this point.

Therefore it is important to keep in mind that sustainable development has a better chance of being implemented if the assessments and the resulting findings and recommendations have emerged from processes that have gained the trust and commitment of local communities.

Already in 1980 the World Conservation Strategy emphasized the need for local participation, particularly by involving local communities in managing protected areas. National parks and other protected areas cannot be viably established and maintained by legal and administrative measures alone. Mankind is an integral part of any ecosystem. Hence environmental objectives as well as broader long term sustainable development goals need grassroots involvement.

This is a crucial point for natural resource management generally but also more specifically for sustainable development in the Arctic. The role of local people and local communities in pursuit of these goals demonstrates why the concept of sustainable development must include the economic, social and environmental dimensions. In the real world it makes no sense to emphasize just one of these three. Communities must understand

The big question is not whether major changes will take place but rather the magnitude of these changes and how disruptive they will be on the Arctic people. Is a sustainable development path possible?

how they can solve problems within a broader and more comprehensive approach that enables them to assess not only the economic costs and benefits of various development options but also their social and environmental impacts.

In my experience local people and communities can often lose trust in proposed action that only considers one single perspective. Considering economic, social or environmental issues in isolation of each other can lead to findings that are unsustainable.

Education remains essential. Through expanded educational opportunities local people will be able to relate their own knowledge to those of other communities in the Arctic. That is why university networks such as the University of the Arctic are so important.

Interconnection and integration of experience-based knowledge enables local people to understand how development changes can best be accommodated. The combination of knowledge from their own culture and from their own experiences through learning from others will help them make sound choices on how to implement sustainable development – how to move it from sound concepts to sound practice.

The development of Arctic areas will thus involve huge changes over the next several decades and the longer term. A sustainable development approach will in my view provide the best framework of preparing for these changes and for promoting sustainable solutions. Sustainable development is a concept that is now widely accepted in international forums. It is also being pursued more vigorously among research institutions. Sustainable use principles are gaining broader acceptance, even among environmental organizations that previously were resistant to this idea. Continuing attention must be given to overseeing that single-issue concerns do not lead to indiscriminate use of policy tools, such as economic bans, unless there are overwhelming science-based findings that so warrant it.

Hopefully policy-makers will become better aware and informed about the dangers inherent in the use of such blunt policy instruments.

Local communities and local government administrations in the Arctic should be assisted in learning how to integrate economic, social and environmental factors so that these can be understood in an overall operational framework. As in other parts of the world, an educated Arctic population is the best hope for translating sustainable development from the conceptual stage into constructive reality.

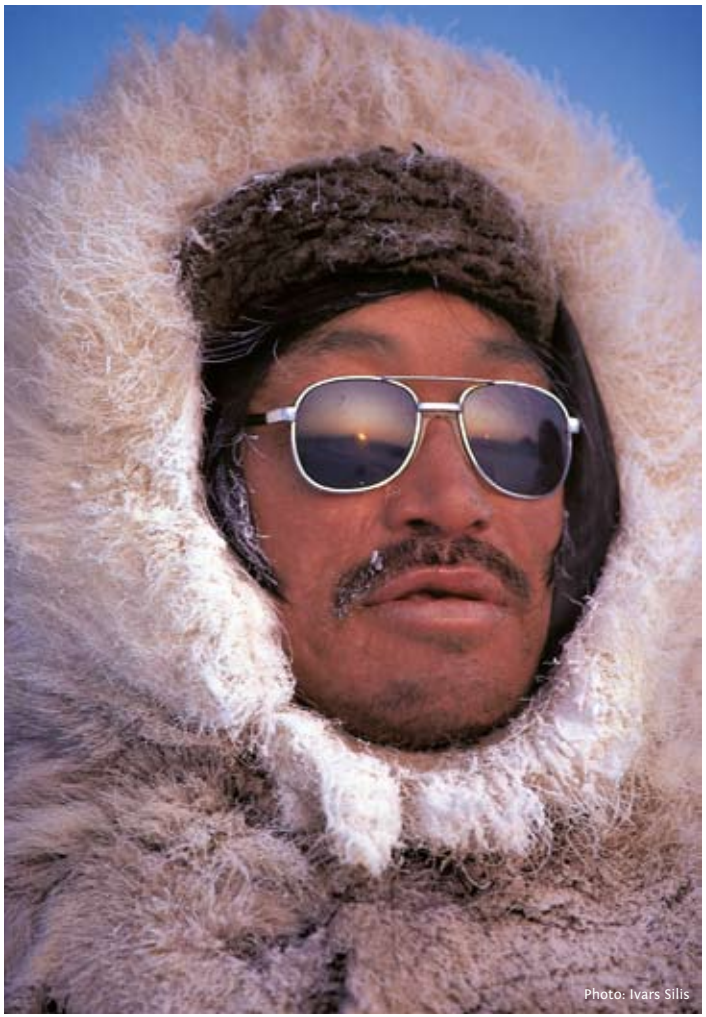

Photo: Ivars Silis

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RESEARCH IN THE ARCTIC

Arctic research is not a discipline as such, but a collection of themes that for various reasons are related to the Arctic. It encompasses both basic and applied research, and it creates important linkages among communities, industry representatives and policy-makers. How is Arctic research special? Where are we today? How can we use it in the future?

Over the last 15 years the Arctic region has changed to a very "hot" area from being a distant place mostly known by the inhabitants and some "strange" people from outside with special interest in the area. Today the Arctic plays key roles in such phenomena as climate change, ozone depletion, organic pollutants and the exploitation of biological resources. Moreover, prospects for oil and gas in polar oceans and potential expansion of sea-based transport on the basis of predictions of reduced ice cover, as well as fisheries management, have raised the needs and interests for increased research activities. (Aksnes and Hessen 2008).

The Arctic is a region characterized by considerable variations in population, climate, culture and community life (Young and Einarsson 2004). Many Arctic landscapes are pristine; their flora and fauna are adapted to the cold and are largely undisturbed by human physical activity, even though such areas have also been affected by contaminants of distant origin. (Conservation of Arctic Flora and Fauna 2001). In other areas, however, there is extensive exploitation of biological and mineral resources. The Polar Regions are an active and vital component of our planet, and significant changes are occurring there. They harbour information about the Earth's past geological behaviour and have growing economic and geopolitical importance. The harsh physical conditions and remote location of the Polar Regions, however, have hampered scientific investigation compared to other areas (Rapley et al. 2004).

There is a long tradition for scientific collaboration in Polar research, and many international scientific polar/arctic organizations exist. Innovative and sophisticated research today is typically international and interdisciplinary, and these elements are especially salient in Arctic research. This might be explained by the extranational setting in which polar research often is carried out, the interdisciplinary nature of polar research, and the small size of national polar research communities (Aksnes and Hessen 2008).

The Arctic's vastness, remote location and extreme climatic conditions make logistical cooperation – among people, disciplines, regions and countries – all the more attractive and even necessary, and this make a notable difference compared to other areas of cooperative research. The focus on international collaboration does

Photo: F. Lukasseck / Scanpix

› *Expedition Ship Grigory Mikheev, Spitsbergen, Svalbard, Norway*

TO DAY? HOW CAN WE USE IT IN THE FUTURE?

› *Scientific investigations in arctic area. Drift ice. Floating ice. Sea ice. Spitsbergen, Svalbard*

not make polar/arctic research free of a geopolitical dimension connected to sovereignty claims and access to hydrocarbon and biological resources. This is particularly evident in Antarctica where in order to become a Consultative Party to the Antarctic Treaty a country needs to demonstrate its commitment to Antarctica by carrying out substantial scientific activity in the region (Aksnes and Hessen 2008). The Arctic is in general more accessible than the Antarctic, and Arctic territory is inhabited, shared by several countries pursuing their own research, and is in contrast to the Antarctic research not governed by an international treaty for the region.

HISTORY

The Polar Regions have long attracted many researchers situated outside the Arctic to conduct research of their own. The long tradition for science cooperation in polar areas was demonstrated in 2007 with the fourth International Polar Year (IPY) .

The IPY story shows the evolution of the polar and Arctic science cooperration. Over the past 125 years scientists from around the world have organized focused scientific and exploration programmes in the polar regions. Such a year of concentrated research leads to a remarkable increase in scientific knowledge and geographical exploration. By extending the understanding of many geophysical phenomena that influence nature's global systems, the experience gained by scientists and governments in international cooperation has been an inspiration for other international scientific collaborations, as well as political agreements based on momentum from the polar years.

The First International Polar Year was in 1882-83. An Austrian explorer, naval officer and scientist Lt. Karl Weyprecht, was aware that solutions to the fundamental problems of meteorology and geophysics were most likely to be found near the Earth's poles, and he also found that geophysical phenomena could not be surveyed by one nation alone. As a result 12 countries participated in 15 expeditions to the poles with 13 to the Arctic. The legacy of the First International Polar Year besides the enhanced geographical and geophysical knowledge was the foundation for international scientific cooperation.

The Second International Polar Year took place in 1932-33. It was proposed by the International Meteorological Organization as an effort to investigate the global implications of the newly discovered "Jet Stream." Forty nations participated in the Second IPY, resulting in advances in meteorology, magnetism, atmospheric science, and in radio science and technology. In the Arctic 40 permanent observation stations were estab-

lished, and in Antarctica the first all-year inland meteorological station was established.

The International Geophysical Year (IGY) took place in 1957-58. It benefitted from the the technological advances developed during World War II (for example, rocketry and radar) so the technological and scientific momentum was towards research particularly in the upper atmosphere. The IGY's research, also confirmed the theory of continental drift, and the total size of Antarctica's ice mass was estimated by geophysical traverses over the Antarctic icecap. For many disciplines, the IGY led to an accelerated level of research that continues to the present. The world's first satellites were launched. As an outcome of the research cooperation the Antarctic Treaty was ratified in 1961(Rapley et al. 2004).

The recently concluded International Polar Year (IPY) 2007-09 focused on the poles, but also with a global dimension. Sponsored jointly by the International Council for Science (ICSU) and the World Meteorological Organization (WMO) the goal was to exploit new technological capabilities and strengthening international research coordination. In contrast to previous "years", this programme placed a stronger emphasis on interdisciplinary research involving the life and social science communities, indigenous communities and educators as well as an outreach part. It involved more than 160 projects and the participation of thousands of scientists from more than 60 nations, who have examined a wide range of physical, biological and social research topics with international funding support of about US$ 1.2 billion over the two-year period. This IPY was motivated by many factors including: the polar regions' interconnection with other components of the planet; the significant changes in the region; their storage of unique information about past events on the planet:their unique vantage point for observing a variety of terrestrial and cosmic phenomena; and their growing economic and geopolitical importance (Rapley et al. 2004).

The 2007-09 IPY was the first to include the social and life sciences in its overall strategy – the others concentrated only on geophysical themes. Such development of IPY themes reflects the fact that polar phenomena extend across national boundaries the desire for a coordinated approach for maximizing research outcomes and cost-effectiveness. Also evident in the 2007-08 IPY is the conviction that outreach is a very important part of the process: much greater attention has been paid to explaining how climate change in the Arctic affects the entire globe and to raising the general level of knowledge about the Arctic. These IPY results will be increasingly visible in coming years.


Photo: Ivars Silis

THE STATUS OF ARCTIC RESEARCH TODAY

The growing interest in the Arctic has enhanced the need and interest in better data, information and knowledge about the region, which together with the revolution in technological communication has increased Arctic research. Recently Aksnes and Hessen

investigated the status and development of polar research from 1981 to 2008 on a publication-based approached. In terms of publications polar research has grown at a much faster rate than the global scientific output in general. The five Arctic-rim states are among the seven largest contributors. Together they account for 63% of all Arctic papers in the most recent period (2005-07) and 85% in the first (1981-83). The number of papers has increased by 60% between 1991-93 and 2005-07. Also the number of countries engaged in polar research over the past 25 years has grown.

Strong international collaboration appears to be a characteristic of polar research. In the early 1980s, less than 10% of the articles on polar research involved international co-authorship, while in 2007 this proportion had increased to 41%, which is twice the global average for all fields (Aksnes and Hessen 2008). It is an interesting observation that internationally co-authored publications generally achieve higher citation rates than purely domestic publications (i.e. publications with authors from one country only) (Narin et al., 1991). Also for polar research, international collaborative articles are more frequently cited than national publications (Aksnes and Hessen 2008). This trend will possibly be reinforced, when the latest IPY research become visible. Apparently, the scientific influence of the research increases when researchers from more than one nation collaborate. These results are obviously due to growing interest in the region, but also by the improved cooperative framework such as the creation of The University of Arctic and the Arctic Council.

> *The Arctic's vastness, remote location and extreme climatic conditions make logistical co-operation – among people, disciplines, regions and countries – all the more attractive and even necessary, and this makes a notable difference compared to other areas of cooperative research.*

THE ARCTIC COUNCIL'S INFLUENCE ON RESEARCH

In 1991 the eight Arctic countries initiated the Environmental Protection Strategy (AEPS). An Arctic Monitoring and Assessment Programme (AMAP) was established to monitor the levels and assess the effects of selected anthropogenic pollutants in all parts of the Arctic. The task was to organize, collect and present research data in a way that would be useful to decision-makers and the public (AMAP 1997). This collaborative effort involved more than 400 scientists and administrators. By harmonizing national programmes, an overview provided comparable data of contaminants in the entire Arctic region. The assessment was based on data derived from national and international monitoring programmes and scientific data within the eight Arctic countries supplemented by contributions from non-Arctic countries and international organizations (AMAP 1998). Since the assessment reflected the reality of all the Arctic countries, its influence was considerable. In addition to its valuable data and research, and it facilitated the 1998 Protocol on Persistent Organic Pollutants (POPs) and the 1999 Protocol to Abate Acidification, Eutrophication and Ground-Level Ozone, both under the United Nations Economic Commission for Europe's Convention on Long-Range Transboundary Air Pollution (LRTAP) (United Nations Economic Commission for Europe 1998, 1999). Its adoption sent a very strong message that those Arctic inhabitants living in the traditional way, eating foods native to the region, had the world's highest levels of PCB and mercury – contaminants produced mainly outside the region (AMAP 1998).

The cooperative effort of AMAP also led to a circum-Arctic network of scientists working on contamination issues capable of interpreting results and making science-based recommendations. The assessment process forced the scientists to take an interdisciplinary approach, and it challenged them to provide indigenous peoples with advice that balanced the cultural priority of maintaining a traditional, healthy diet with the ur-

gent need to address the problem of contamination of the local food supply. At the same time, they must find a way to make it clear to Arctic inhabitants and the rest of the world that the issue of increasing contaminant levels was a complex one: not every organism in the Arctic was contaminated; on the contrary, many food items remained untainted.


Photo: Ivars Silis

The scientific cooperation on the Arctic Climate Impact Assessment Process is another example on how such collaboration can be an effective way to raise the level of information to the community including decisions makers about climate change in the Arctic. The Arctic Council supported a regional perspective to the IPCC's assessment through the Arctic Climate Impact Assessment.. This included knowledge on climate variability and change in the Arctic including consequences for human health, social, cultural and economic impacts. The project demonstrated both political and scientific cooperation through the International Arctic Science Committee (IASC), and also included the indigenous people in the process, as well as both the global and the local effects of climate change (Nilsson 2007).

The regional scientific perspective on the impact of climate change on indigenous peoples created a connection to the area of political rights, and this in turn created a formal role for indigenous peoples throughout the assessment process. The participation of indigenous peoples has not been common in other climate assessments, but the new approaches to producing knowledge about Arctic climate change have strengthened that dimension. ACIA also illustrates how organizations such as the Arctic Council can influence knowledge production by creating space for new actors, as well as by promoting and coordinating research in several disciplines and by focusing policy demands for knowledge (Nilsson 2007).

PLANNING OF ARCTIC RESEARCH

The International Conference on Arctic Research Planning (ICARP), which takes place every 10th year is an example of how the Arctic science community through the International Arctic Science Committee (IASC) sets its research agenda. The process involves all Arctic science organizations and demonstrates a high level of commitment to Arctic science cooperation. Twelve working groups composed of leading international researchers worked for two years on the development of science plans with a 10-year perspective to improve understanding of the region and to address major questions. Between the first and second conference in 2005, there has been a shift to a holistic and multidimensional perspective in the Arctic research plans. This perspective includes the human dimension, indigenous insights and recognition that the Arctic, due to its strategic position, is a unique and important

› *Scientist weighing seal pup on Svalbard*

part of the planet – environmentally, socially, economically and politically. The agenda also reflects concern for data management, interoperability and dissemination. It also considers the future need for enabling infrastructure to provide the platforms for the next generation of users including remote sensing equipment, icebreakers, circum-Arctic observing networks (ICARP II Steering Group and ICARP II Secretariat 2007).

CHALLENGES AND POSSIBILITIES FOR FUTURE RESEARCH COOPERATION IN THE ARCTIC

Although bottom-up science cooperation in the Arctic is substantial, this has not been true at the government level. It is notable that a lot of the research behind the Arctic Climate Impact Assessment was based on results from research activities that began with the International Geophysical Year half a century earlier ("Coming in from the Cold" 2006).

The last Polar Year and the enhanced interest for the Arctic region have for most countries stimulated a call for change. An intergovernmental framework could help bridge between scientific bottom-up cooperation and the top-down involvement of governments. The International Polar Year has significantly focused the attention of the Arctic Council on scientific collaboration and to keep up the momentum of the initiative and to make use of the results. The Arctic Council has taken steps to ensure that the IPY work, findings and experiences are used in a best possible manner for Arctic management and governance (Arctic Council 2009).

The Arctic Council has in the Salekhard Declaration urged its member countries to maintain and extend long-term monitoring of change in all parts of the Arctic (Arctic Council 2007). In Washington in April 2009 the members of the Antarctic Treaty and the Arctic Council issued a declaration urging states, national and international scientific bodies, and other interested parties to ensure a lasting legacy from the IPY and to support appropriate infrastructures (Antarctic Treaty-Arctic Council Joint Meeting).

The Arctic Council will together with other international Arctic organizations to investigate ways to build a coordinated Arctic observing network (Arctic Council 2009). This could be an important outcome of IPY. Most of the five Arctic Sea countries (USS, Canada, Norway, and Russia) are enhancing their research budgets as are many other interested countries outside the Arctic region.

Polar research is organized differently around the world. This diversity in organization and best practices is a significant challenge to those working to promote international science cooperation. The European Union's Sixth Framework Programme financed an initiative to stimulate greater research and technological European cooperation involving all 25 of Europe's major polar research funding agencies. Their goal is to share information and facilities and gradually to integrate their programmes and optimize their combined annual budgets (European Polar Consortium 2005).

These trends in Arctic research will probably continue as an increasing share of major science issues (e.g. joint cruises on large vessels, multinational research efforts and joint use of large infrastructure) will demand international cooperation at all levels.In what

ways is the Arctic changing? What will the region be like in the future? These crucial questions are being asked by policy-makers, land-use managers and, not least, the people who live in the Arctic.

The research cooperation mentioned above has helped to raise these questions and developed plans to address them. Assessing the current state of scientific knowledge and determining future research needs must cross national borders and span many disciplines. The IPY has been a major factor in enhancing these important developments. The scientific results from IPY are still under preparation but one result is already clear: international partnerships are an important legacy of the International Polar Year.

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Photo: Jerzyworks / Scanpix

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CHALLENGES AND STRATEGIES FOR ILISIMATUSARFIK

University of Greenland

Twenty-five years since its inception as the University of Greenland, Ilisimatusarfik has evolved from a fledgling campus to a young, but vibrant institution that is in the process of investing in its own future. The founding of Greenland's own university has ensured a research-based collection of knowledge in and about Greenland, enabling accumulated knowledge to remain in the country, and facilitating the development of professional skills among the population, ensuring that a proportion of highly educated citizens remain in the country.

In February 2009, 21 students graduated with either a bachelors or masters degree from the university, which was the largest graduating class in Ilisimatusarfik's history. Including this year's graduates, the total number of students to have received a bachelors degree since the university was founded twenty-five years ago has reached 115, while masters degree students number 50.

Ilisimatusarfik was originally established as an Inuit Institute in 1984, with Professor Robert Petersen as its first head. Since then things have developed rapidly, with the university now offering five bachelors degrees, three secondary teacher training programmes, four masters degrees, and two diploma courses. Several pother programmes are currently still in development.

Ilisimatusarfik is almost entirely financed by the Self Rule administration, with 110 million Danish kroner of funding provided for in the national budget. Fund appropriations, overhead and rental income constitute approximately 15-18 million Danish kroner annually.

NEW UNIVERSITY ACT

The reason behind the new University Act of November 2007 was partly a political commitment to develop skilled trade, social work, journalism, teaching and nursing courses into research-based programmes, and a desire to connect the educational developments of the Institute of Education to Ilisimatusarfik.

The goals of the new university legislation were to create a powerhouse of higher education, research and dissemination that would help make Greenland a central and respected international participant in Arctic region research, attracting recognised researchers and students from outside the country and thereby promote awareness of Greenland.

The Act provided for the establishment of a new organization, consisting of a board with an external majority, competitively recruited management and the establishment of academic and institutional councils. Henceforth institute and department heads will be recruited competitively as opposed to the former situation whereby the posts were internally filled from existing staff.

Teaching and research is done by a staff of 75 permanent teachers and upwards of 40 guest teachers employed at the university. At the Institute of Education a further 45 people are working with a GU reform (a national econdary education college preparing students for higher education), school and day-care centre reforms, and publishing / printing activities, tasks that have also fallen under the jurisdiction of the new university.

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There are now nine educational divisions grouped together under Ilisimatusarfik, namely the profession-oriented bachelor programmes: Teacher Training, Social work, Nursing, and Journalism, together with the classical courses: Culture and Social History; Language, Literature and Media; Administration; Theology; and masters level studies at the Institute of Education.

ILIMMARFIK

The newly restructured university, with the exception of teacher training, nursing and the Institute of Education moved to new buildings beside the Greenland Institute of Natural Resources on 1st January 2008. Both staff and students now enjoy larger premises and newer equipment, while the library has received new, bigger and more attractive surroundings with room for further collections. Major conferences, meetings and courses are now possible, with more students able to assemble in the same place, creating the ideal foundation for a better study environment.

ILISIMATUSARFIK'S CHALLENGES

Some of the challenges faced by the university become apparent if one looks at the average yearly graduates since 1996. The 50 masters students that have graduated since 1996 are equivalent to 3.8 students per year, while the 115 bachelor students who have graduated are equivalent to 8.8 students per year, though this figure excludes professional bachelor courses such as teacher training, journalism, nursing and social work.

These figures are witness to the fact that it has been difficult for the university to retain students after bachelor level studies. One of the most likely reasons for this is that there is a great demand in Greenland for both a local and educated workforce, making it easy for those with a bachelor degree to find employment. A new strategy is required whereby the university offers postgraduate opportunities to ensure that more students complete masters level courses.

For a small university with few employees it is necessary to develop courses that cover a broad spectrum but also recognise the need for specialization. The Department of Administration now offers an MSc programme (Cand.Scient.Adm.) focusing on administrative law, sociology, economics and political science. Due to various considerations, such as the requirements of the new Self-Rule administration, masters and part-time courses in economics and law are being considered, reflecting the need for specific skills that are essential elements for developing increased self-governance.

One of the major challenges that have arisen from the incorporation of vocationally-oriented bachelor programmes into the university system is how to make them research based. For example, how extensive should the research basis be? What is practical research? How much does the research element cost and where will the

resources come from? Some courses are already well underway and have been planning their research focus for a long time while others have just about managed to keep their heads above water, partly due to a lack of teaching staff. However, it is an exciting period of integration for the university, which hopes to continue to improve academic quality, creating increasingly competent journalists, nurses, teachers and social workers.

An education system that delivers what is required of it is of great importance for the future of national education. Therefore teacher training and reforms carried out by the Institute of Education connected to the national middle-school system have been incorporated under the jurisdiction of the university. The aim is to strengthen ambition and cooperation at Atuarfitsialak, known as 'the good school', which has gone through a period of reform now for nearly 10 years.

Due to political awareness and the implementation of first Home Rule and then Self-Rule, Greenlandic language has been strengthened on all fronts, not least in the political arena. Language as an important marker of identity is still a subject lively debated among the population, particularly in relation to results achieved by and expected from the education system. The vast majority of courses require students to understand, speak and write Danish. However, because of the status of Greenlandic as the priority language in middle schools, together with the increasing number of trained teachers who use Greenlandic, many young people leave school without the necessary level of Danish required. This would not have been a problem 25 years ago due to the earlier societal structure. However, it is a very important issue today at a time when society, living conditions and expectations for self-governance and independence are greater.

There are no language requirements at Ilisimatusarfik, but it is a positive political and social development that people today are encouraged to learn several languages. Many students in the final year of middle school are

Photo: Bryan Reinhart / Scanpix

now opting to attend residential schools in Denmark with the intention of improving their Danish. It is an essential development, resulting from a popular desire for greater autonomy in Greenland.

COOPERATION WITH INDUSTRY

Ilisimatusarfik's courses have been based on the humanities and social science curricula from the outset. In line with developing competency in the business sector, new expectations are arising for continuing education courses geared towards the commercial and business sectors.

Because of this demand, Ilisimatusarfik has initiated, in cooperation with Aalborg University, a post-graduate diploma course (HD), starting from September 2009. Two specialisations will be available: Organization and Management, and Accounting and Financial Management. The post-graduate phase diploma is the latest course offered by Ilisimatusarfik, for which both the business sector and the university have high expectations. The large number of applications for the autumn semester bode well for both specialisations.

Increased cooperation with industry is an important goal for Ilisimatusarfik. A strategy will be developed to that end enabling the university, together with other educational institutions, to increase its participation in development of business and trade in society, which is in need of innovation and creative power. Ilisimatusarfik can also initiate and respond in relation to business and its interaction with society in general.

INTERNATIONALISATION

In order to gain international recognition and stature, the university needs to work more intensively toward insuring that its teaching and research are on par with other international institutions. The university expects that the appointment of an international coordinator will facilitate increased student and lecturer exchanges with other international universities.

By working to obtain Erasmus University Charter status, the university hopes to make it easier to increase exchanges of its own students and lecturers with foreign universities, and intensive efforts are already underway to create concrete cooperation agreements with universities in the U.S. and Canada.

Ilisimatusarfik has long had established and close cooperative relations with several Danish universities through formal agreements. The next step is to establish similar

› *Dimittends at Ilisimatusarfik*

relations with foreign universities, with several already underway. Indigenous peoples' issues, climate, and environmental changes in the Arctic are all areas international interest, which makes Ilisima-tusarfik's cooperation with various parties in Green-land very beneficial and important.

The university is part of the PhD collaboration IPSSAS (International PhD School for the Study of Arctic Societies) which includes university communities from Greenland, Denmark, Canada, Alaska, France and Scotland. Cooperation includes a PhD school, which organises annual seminars for students and researchers in the participating countries. Specific areas of cooperation include past and present cultural, linguistic and societal considerations (Arctic/Inuit). The universities take turns organizing seminars, with Ilisimatusarfik preparing to host in 2011, for which the theme of adaptability has been proposed.

PARTICIPATION IN NORDIC COLLABORATION

Ilisimatusarfik is represented in several Nordic initiatives for promoting education and research, including Nordplus, Nordlys and Nordliks, which provide network activities and opportunities for exchange with other Nordic colleagues and students, an opportunity that should not only continue but be developed. Representation on the board of NordForsk provides Ilisimatusarfik with good opportunities to gain inspiration and participate in the development of Nordic research cooperation. Not only does Greenland's active participation in NordForsk's collaborative efforts to develop the Nordic region as a top research centre capable of competing with major international research units set a good example, it may also encourage other Arctic research groups to follow suit.

STUDENTS

Greenland's youth have never had so many educational opportunities at home and abroad but at the same time, there have never been so many demands on the individual. While advantageous student support means that, unlike in many other countries, students can leave the education system almost entirely free of debt, there are problems with too many students not completing their higher education. Some of the reasons given for this problem include lack of academic maturity, personal problems or lack of professional competence. A lack of family tradition in education may also play a fundamental role in this context, and in connection with this, support and expectations from home have a significant role. A number of drop out prevention initiatives have helped to somewhat reduce the problem: including more individual academic guidance, psychological help and recruiting "house mothers" for student halls of residence.

Greenland's youth have never had so many educational opportunities at home and abroad but at the same time there have never been so many demands on the individual.

While higher education establishments will continue to make demands of their students, the students themselves also make demands of both their courses and their lecturers, just as they expect that their education is on par with similar courses abroad.

VISION

Some of Ilisimatusarfik's major challenges are internal. A large number of the university's current staff is nearing retirement age which makes a recruitment strategy necessary for both continuity and renewal.

Cooperation with funding authorities is necessary to meet not only current requirements but also to ensure increasing internationalisation, innovation, industry cooperation, and both the expectations and aspirations of education and research.

Another important tool in developing research is to increase participation and bidding for research projects in cooperation with others. The establishment of the climate centre,which has provided Ilisimatusarfik with a faculty position to cover the social science aspect of research, has opened new opportunities for research growth.

Ilisimatusarfik is now entering a period where plans and strategies need to be renewed. The university will present both a vision and strategy statement during 2010 that will be drafted with the participation of the board of directors, staff, students and customers.

The new University Act has defined the basic requirements: increased internationalisation and grounding in research, synergy, cooperation and development. At its last meeting the board established a draft vision for further discussion of the process. The draft reads:

"With its research and various educational courses, the University of Greenland is a leading and expanding university in the Arctic region.

- Ilisimatusarfik develops and provides research and education at an international level.
- Ilisimatusarfik is an international leader within its research and educational areas of Greenland and other Inuit communities, language, culture, health and history.
- Ilisimatusarfik ensures an equal interplay between research, development and education.
- Ilisimatusarfik continually develops its research, knowledge dissemination and educational areas in active partnership with Greenlandic society and contributes to sustainable development both in the Arctic and globally.
- Ilisimatusarfik enhances interaction through advice and knowledge transference to both society and business, encompassing both civil society in Greenland and the international research community, while protecting its research and methodology freedom.
- Ilisimatusarfik continues to enhance its position as an Arctic and internationally oriented university without abandoning its obligations to Greenlandic society."

DARING TO HAVE THE VISION

It is my task as Head to ensure the continued development of education and research emanating from the university. However, the university cannot satisfy itself simply by fulfilling its legal obligations. It must have ambition, and it must grow and produce results that gain recognition both nationally and internationally. It is an ambition that requires willingness to change and a collaborative culture in which everyone can participate.

Photo: Ivars Silis

This publication is the result of cooperation between The Scandinavian Seminar College, a non-governmental institution, The Danish Society for Futures Studies and The University of the Arctic.